TRANSACTIONS

OF THE

OTOLOGICAL SOCIETY

VOL. VII

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TRANSACTIONS

OF THE

OTOLOGICAL SOCIETY

OF THE

UNITED KINGDOM

VOLUME THE SEVENTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE SEVENTH SESSION, 1905–1906

Edited by Jobson Horne, M.D.

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PAST PRESIDENTS

1899–1901. Sir William Dalby.

1901–1903. Urban Pritchard.

1903–1905. Thomas Barr.

THE OTOLOGICAL SOCIETY
OF THE UNITED KINGDOM

OFFICERS AND COUNCIL

ELECTED DECEMBER 4, 1905

President

ALPHONSO ELKIN CUMBERBATCH

Vice-Presidents	CHARLES A. BALLANCE ADOLPH BRONNER ROBERT HENRY WOODS
Hon. Treasurer	EDWARD LAW
Hon. Secretaries	PERCIVAL MACLEOD YEARSLEY HENRY SECKER WALKER
Hon. Editor of the "Transactions"	WALTER JOBSON HORNE
Hon. Librarian	RICHARD LAKE
Other Members of Council	THOMAS BARR FREDERICK WILLIAM FENNETT CHARLES HERBERT FAGGE LAURIE ASHER LAWRENCE WILLIAM PERMEWAN ARTHUR LOGAN TURNER

THE ABOVE FORM THE COUNCIL

PATHOLOGICAL COMMITTEE

REFEREES

FREDERICK W. ANDREWES
SAMUEL G. SHATTOCK

ARTHUR HENRY CHEATLE
CHARLES HERBERT FAGGE
WALTER JOBSON HORNE
VITRUVIUS HAROLD WYATT WINGRAVE

LIST OF MEMBERS OF THE SOCIETY

Honorary Member.

Professor ADAM POLITZER, Vienna.

EXPLANATION OF ABBREVIATIONS.

P = President.
VP = Vice-President.
T = Honorary Treasurer.
Italics = Original Members.
L = Honorary Librarian.
C = Councillor.
S = Honorary Secretary.
E = Honorary Editor of the "Transactions."

The abbreviations placed after a Member's name indicate offices which have been held by him.

N.B.—Members are reminded that they are, themselves, responsible for the correctness of the descriptions in the following lists, and it is particularly requested that any change of title, appointment, or residence, may be communicated to the Senior Secretary before July 1 in each year.

ABERCROMBIE, PETER HENDERSON, M.D.(Glasg.), 56 Harley St., W. Assistant Surgeon to the Central London Throat, Nose, and Ear Hospital. *Elected December* 2, 1901.

ADAMS, FREDERICK VASEY, F.F.P.S.(Glasg.), 10 Queen's Crescent, Glasgow. Assistant Surgeon to the Glasgow Ear Hospital. *Elected March* 3, 1902.

Baber, Edward Cresswell, M.B., 46 Brunswick Square, Brighton, and 62 Brook St., W. Surgeon to the Brighton, Hove and Sussex Throat and Ear Hospital. *L. VP.*

Ball, James Barry, M.D., 12 Upper Wimpole St., W., Physician to the Throat, Nose, and Ear Department, West London Hospital.

VP Ballance, Charles Alfred, M.B., M.S., F.R.C.S., 106 Harley St. Late Aural Surgeon to St. Thomas's Hospital. *S.C.VP.*

Ballance, Hamilton Ashley, M.D., M.S., F.R.C.S., 46 Prince of Wales Rd., Norwich.

BARR, JOHN STODDART, M.B., Ch.B.(Glasg.), 13 Woodside Place, Charing Cross, Glasgow. Assistant Surgeon to the Glasgow Hospital for Diseases of the Ear. *Elected February* 5, 1906.

C *Barr, Thomas,* M.D.(Glasg.), 13 Woodside Place, Charing Cross, Glasgow. Senior Surgeon to the Glasgow Hospital for Diseases of the Ear; Lecturer on Aural Surgery to the University of Glasgow. *VP. P.*

C *Bennett, Frederick William,* M.D., 25 London Rd., Leicester. Surgeon to the Ear and Throat Department, Leicester Infirmary.

Benson, Arthur Henry, M.A., M.B.(Dub.), F.R.C.S.I., 42 Fitzwilliam Square, Dublin. Ophthalmic and Aural Surgeon to the City of Dublin Hospital.

Bond, James William, M.D., B.S., 26 Harley St., W. Physician to the Hospital for Diseases of the Throat, Golden Square.

Bowen, William Henry, M.S.(Lond.), F.R.C.S., 27 New Cavendish St., W. Assistant Surgeon, Royal Ear Hospital. *Elected February* 6, 1905.

VP *Bronner, Adolph,* M.D.(Heidelb.), 33 Manor Rd., Bradford, Yorks. Surgeon to the Bradford Eye and Ear Hospital. *C.*

Browne, John Walton, B.A., M.D., 10 College Square North, Belfast.

Bull, William Charles, B.A., M.B., F.R.C.S., 5 Clarges St., Mayfair, W. Aural Surgeon and Lecturer on Aural Surgery to St. George's Hospital.

Carson, Herbert William, F.R.C.S., 26 Welbeck St., W. Surgeon in charge Throat and Ear Department, Tottenham Hospital. *Elected December* 1, 1902.

Cathcart, George Clark, M.A., M.B., C.M.(Ed.), 35 Harley St., W. Assistant Surgeon to the London Throat Hospital. *Elected December* 3, 1900.

Cheatle, Arthur Henry, F.R.C.S., 18 Savile Row, W. Aural Surgeon to King's College Hospital; Aural Surgeon, King Edward VII Hospital for Officers; Hunterian Professor, Royal College of Surgeons, 1906. *S.E. C.*

Cocke, Robert Sturgeon, M.R.C.S., L.R.C.P., 84 Harley St., W. Assistant Surgeon, Royal Ear Hospital. *Elected February* 6, 1905.

Connal, James Galbraith, M.B., C.M., F.F.P.S.(Glasg.), 4 Burnbank Terrace, Glasgow. Lecturer on Aural Surgery to Anderson's College Medical School; Surgeon to the Throat and Nose Department, Central Dispensary, Glasgow; Assistant Surgeon to the Glasgow Ear Hospital. *Elected May* 2, 1903.

P *Cumberbatch, Alphonso Elkin* M.B., F.R.C.S., 11 Park Crescent, Portland Place, W. Aural Surgeon, to St. Bartholomew's Hospital and National Hospital for the Paralysed and Epileptic, Queen's Square. *T. VP.*

Dalby, Sir William Bartlett, B.A., M.B., F.R.C.S., 18 Savile Row, W. Consulting Aural Surgeon to St. George's Hospital. *P.C.*

Davis, Henry John, M.A., M.B., B.C.Cantab., M.R.C.P.Lond., 8 Portman Street, W. Aural Surgeon to the West London Hospital. *Elected February* 5, 1906.

Deanesly, Edward, M.D., F.R.C.S., 4 Waterloo Rd., Wolverhampton. Aural Surgeon to the General Hospital, Wolverhampton. *Elected March* 3, 1902.

Donelan, James, M.B., M.Ch.(R.U.I.), 6 Manchester Square, W. Physiologist, Laryngologist, and Aurist to the Italian Hospital. *Elected February* 2, 1903.

C Fagge, Charles Herbert, M.B., M.S., F.R.C.S., 3 Devonshire Place, W. Aural Surgeon to Guy's Hospital. *Elected March* 5, 1900.

Farquharson, John Malcolm, M.B., C.M., F.R.C.P.(Ed.), 2 Coates Pl., Edinburgh. Surgeon to the Edinburgh Ear, Nose and Throat Infirmary; Lecturer on Diseases of the Ear, Nose and Throat, School of Medicine of the Royal Colleges, Edinburgh. *Elected December* 2, 1901.

Field, George P., 34 Wimpole St., W. Consulting Aural Surgeon to St. Mary's Hospital. *VP.*

Fullerton, Robert, M.D., M.C.(Ed.), 24 Newton Place, Glasgow. Honorary Consulting Surgeon for Diseases of the Throat, Nose and Ear, Greenock Infirmary; Surgeon to the Throat, Nose and Ear Department, Greenock Eye Infirmary. *Elected March* 4, 1901.

Grant, J. Dundas, M.A., M.D., F.R.C.S., 18 Cavendish Square, W. Surgeon to the Central London Throat and Ear Hospital, and Throat and Ear Department West End Hospital for Nervous Diseases. *C.*

Gray, Albert Alexander, M.D., F.F.P.S.(Glasg.), 14 Newton Terrace, Glasgow. Aural Surgeon to the Glasgow Central Dispensary. *Elected February* 3, 1901.

Gordon, Alec Knyvett, M.A., M.B., B.C.Cantab. Fever Hospital, Monsall, Manchester. *Elected February* 5, 1906.

Guild, George Taylor, M.B., C.M.(Ed.), 164 Nethergate, Dundee. Surgeon to the Ear and Throat Department, Dundee Royal Infirmary; Lecturer on Diseases of the Ear and Throat to the University of St. Andrews.

Heath, Charles J., F.R.C.S., 3 Cavendish Place, W. Surgeon to the Hospital for Diseases of the Throat, Golden Square. *Elected March* 4, 1901.

Hill, George William, B.Sc., M.D., 28 Weymouth St., W. Aural Surgeon to St. Mary's Hospital.

E *Horne, Walter Jobson,* M.A., M.D., B.C.(Cantab.), M.R.C.P., 23 Weymouth Street, W. Surgeon to the Metropolitan Ear, Nose and Throat Hospital; in charge of Throat and Ear Department Farringdon General Dispensary. *S.*

Horsley, Sir Victor, F.R.S., 25 Cavendish Square, W. *C.*

Hovell, T. Mark, F.R.C.S.(Ed.), 105 Harley St., W. Consulting Aural Surgeon to the London Hospital. *C.*

Hunt, John Middlemass, M.B., C.M.(Glasg.), 55 Rodney St., Liverpool. Laryngologist to the Royal Infirmary, Liverpool.

Hutchison, Arthur Jaffray, M.B., C.M. (Glasg.), Assistant Surgeon, Brighton Throat and Ear Hospital, 84 Lansdowne Place, Brighton. *Elected March* 6, 1905.

Jackson, George, F.R.C.S.(Eng.), 19 Portland Villas, Plymouth. Senior Surgeon to the Devon and Cornwall Ear and Throat Hospital. *Elected February* 1, 1904.

Jakins, Percy, M.D.(Dur.), 120 Harley St., W. Surgeon to the Central London Throat and Ear Hospital.

Jones, Bertram Seymour, F.R.C.S., 51 Newhall St., Birmingham. Assistant Surgeon, Birmingham and Midland Ear, Nose, and Throat Hospital. *Elected June* 3, 1905.

Jones, Hugh Edward, 19 Rodney St., Liverpool. Surgeon to the Eye and Ear Infirmary, Liverpool; Ophthalmic and Aural Surgeon to the Royal Albert Edward Infirmary, Wigan. *C. S.*

Jones, Henry Macnaughton-, M.D., R.U.I., M.Ch., M.A.O. (Hon. Caus.), F.R.C.S.(I. and Ed.), 131 Harley St, W. Late Surgeon to the Eye, Ear and Throat Hospital, Cork.

Kelly, Adam Brown, B.Sc., M.B., C.M.(Glasg.), 26 Blythswood Square, Glasgow. Surgeon for Diseases of the Throat, Nose and Ear to the Victoria Infirmary and Bellahouston Dispensary.

KELSON, WILLIAM HENRY, M.D., F.R.C.S., 17 Cavendish Place, W. Assistant Surgeon to the London Throat Hospital. *Elected March* 3, 1902.

KERR, JAMES, M.A., M.D., D.P.H.(Cantab.), School Board Offices, Victoria Embankment. Late Surgeon to the Bradford Eye and Ear Hospital. *Elected February* 2, 1903.

L *Lake, Richard,* F.R.C.S., 60 Harley St., W. Surgeon to the Royal Ear Hospital. *C.*

T *Law, Edward,* M.D., C.M.(Ed.), 8 Wimpole St., W. Surgeon to the London Throat Hospital. *C. V.P.*

C *Lawrence, Laurie Asher,* F.R.C.S., 9 Upper Wimpole St., W. Surgeon in charge of Throat and Ear Department, Western General Dispensary.

LEE, CHARLES GEORGE, M.R.C.S., L.R.C.P., 11 Princes Avenue, Liverpool. Honorary Surgeon to the Liverpool Eye and Ear Hospital, Aural Surgeon to the Royal Southern Hospital. *Elected May* 2, 1903.

LEECH, JOSEPH WILLIAM, M.D., M.S., F.R.C.S.(Ed.), 12, Eldon Square, Newcastle-on-Tyne. Senior Surgeon, Newcastle Throat and Ear Hospital. *Elected February* 6, 1905.

LITTLE, ANDREW, M.B., C.M.(Aberd.), 114 Manningham Lane, Bradford. Surgeon to the Eye and Ear Hospital, Bradford. *Elected December* 1, 1902.

LOVE, JAMES KERR, M.D.(Glasg.), Olrig, Newark Drive, Pollokshields, Glasgow. Aural Surgeon to the Royal Infirmary, Glasgow, Honorary Aurist to the Glasgow Institute for Deaf and Dumb, Lecturer on Aural Surgery, St. Mungo's College, Glasgow. *Elected February* 3, 1902.

McBride, Peter, M.D., F.R.S.(Ed.), 16 Chester St., Edinburgh. Aural Surgeon and Laryngologist to the Royal Infirmary, Edinburgh, Lecturer on Diseases of the Ear, Nose, and Throat at the University of Edinburgh. *C. V.P.*

MCCALL, ANTHONY, M.D.(Glasg)., Boscombe Court, Bournemouth. Surgeon to the Throat, Nose, and Ear Department Royal Boscombe and West Hants Hospital. *Elected December* 1, 1902.

MANNING, LESLIE SAMUEL, M.B., C.M.(Aberd.), Christchurch, New Zealand. Aural Surgeon to Christchurch Hospital. *Elected December* 2, 1901.

MARRIAGE, HERBERT JAMES, M.B., B.S., F.R.C.S., 109 Harley St., W. Aural Surgeon to St. Thomas's Hospital. *Elected February* 6, 1905.

MASINA, H. M., F.R.C.S., Grant Medical College, Bombay, India. *Elected February* 3, 1902.

Milligan, William, M.D., C.M.(Aberd.), 12 St. John St., Deansgate, Manchester. Lecturer on Diseases of Ear at Owens College, Manchester, Honorary Surgeon to the Manchester Ear Hospital, Aural Surgeon to the Manchester Royal Infirmary. *S.C.*

MOLE, HAROLD FREDERICK, F.R.C.S., 19 Mortimer Road, Clifton. Surgeon in charge of the Aural Department Bristol Royal Infirmary. *Elected February* 2, 1903.

MURISON, ALEXANDER LOGAN, M.R.C.S., L.R.C.P., 55A Welbeck St., W. Assistant Surgeon, Royal Ear Hospital. *Elected February* 6, 1905.

MURRAY, GEORGE, M.R.C.S., L.R.C.P., 2 Harley St., W. *Elected December* 1, 1902.

NELSON, JOSEPH, M.D., L.R.C.S.(R.U.I.), 20 Wellington Place, Belfast. Aural Surgeon to the Royal Victoria Hospital, Belfast. *Elected March* 7, 1904.

NICOLL, JAMES HENDERSON, M.B., F.F.P.S.(Glasgow), 4 Woodside Place, Glasgow, Consulting Surgeon to the Glasgow Ear Hospital. *Elected March* 7, 1904.

NOURSE, WILLIAM JOHN CHICHELE, F.R.C.S.(Ed.), Abchurch House, Sherborne Lane, E.C. Assistant Surgeon to the Central London Throat and Ear Hospital. *Elected December* 2, 1901.

Paget, Stephen, F.R.C.S., 70 Harley St., W. Aural Surgeon to the Middlesex Hospital. *C.*

PARKER, CHARLES ARTHUR, F.R.C.S.(Ed.), 141 Harley St., W. Surgeon to the Throat Hospital, Golden Sq. *Elected February* 3, 1902.

PATERSON, DONALD ROSE, M.D.(Ed.), M.R.C.P.(Lond.), 15 St. Andrew's Crescent, Cardiff. *Elected March* 5, 1900.

Pegler, Louis Hemington, M.D.(Ed.), 58 Harley St., W. Surgeon to the Metropolitan Ear, Nose, and Throat Hospital.

C PERMEWAN, WILLIAM, M.D., F.R.C.S., 7 Rodney St., Liverpool. Surgeon to the Throat and Ear Department, Southport Infirmary. *Elected December* 3, 1900.

PETERS, EDWIN ARTHUR, M.D., B.C.(Cantab.), 52 Wimpole St., W. Surgeon to the Throat and Ear Department, Bolingbroke Hospital. *Elected December* 1, 1902.

PINDER, THOMAS HENRY, M.R.C.S., Alexandra Road, Manchester. Surgeon to the Manchester Ear Hospital. *Elected February* 2, 1903.

Pollard, Bilton, M.B., B.S., F.R.C.S., 24 Harley St., W. Late Surgeon in charge of Aural Department University College Hospital.

POTTER, EDWARD FURNISS, M.D.(Brux.), M.R.C.P.(Lond.), M.R.C.S., 49 Queen Anne St., W. Surgeon to the London Throat Hospital. *Elected December* 3, 1900.

POWELL, H. FITZGERALD, M.D., F.R.C.S.Edin., 5 Harley St., W. Surgeon to Golden Square Throat Hospital. *Elected February* 5, 1906.

Pritchard, Urban, M.D.(Ed.), F.R.C.S., 26 Wimpole St., W. Aural Surgeon to the King's College Hospital. Professor of Aural Surgery, King's College, Consulting Surgeon to the Royal Ear Hospital. *V.P. P. C.*

Purves, William Laidlaw, M.D.(Ed.), 20 Stratford Place, W. Aural Surgeon to Guy's Hospital.

Sandford, Arthur W., M.D.(R.U.I.), 13 St. Patrick's Pl., Cork. Lecturer in Ophthalmology and Otology at Queen's College, Cork, Surgeon to the Cork Ophthalmic and Aural Hospital. *C. V.P.*

SCOTT, SYDNEY RICHARD, M.S., F.R.C.S., 44 Welbeck St., W. Aural Surgeon, Evelina Hospital. *Elected February* 6, 1905.

Sheild, Arthur Marmaduke, M.B., B.C.(Camb.), F.R.C.S., late Aural Surgeon to the Charing Cross Hospital.

SPICER, FREDERICK. M.D.(Dur.), 17 Wimpole St., W. Surgeon to the Metropolitan Ear, Nose, and Throat Hospital. *Elected March* 3, 1902.

Spicer, Scanes, M.D., B.Sc.(Lond.), 28 Welbeck St., W. Surgeon to the Throat Department and Lecturer on Diseases of Throat at the St. Mary's Hospital.

STEWARD, EDWARD SIMMONS, F.R.C.S., 10 Princes Square, Harrogate. Aural Surgeon to the Harrogate Infirmary. *Elected February* 5, 1906.

Story, John B., M.B., B.Ch.(Dub.), F.R.C.S.I., 6 Merrion Square North, Dublin, Ireland. Honorary Oculist and Aurist to the Claremont Institute for Deaf and Dumb. *C. V.P.*

SYME, WILLIAM SMITH, M.D.(Ed.), 3 Northbank Terrace, Glasgow. Assistant Surgeon to the Glasgow Ear Hospital. *Elected February* 1, 1904.

TEALE, MICHAEL AUBREY, M.R.C.S., L.R.C.P., 38 Cookridge St., Leeds. Aural Surgeon, Leeds Public Dispensary. *Elected February* 6, 1905.

Thomson, St.Clair, M.D., M.R.C.P., F.R.C.S., 28 Queen Anne St., W. Physician to the Throat Hospital, Golden Square, Assistant Physician for Diseases of the Throat to the King's College Hospital.

THORNE, ATWOOD, M.B.(Lond.), M.R.C.S., 148 Harley Street, W. Assistant Surgeon to the London Throat Hospital. *Elected December* 2, 1901.

Tilley, Herbert, M.D., F.R.C.S., 89 Harley St., W. Surgeon to the Ear and Throat Department, University College Hospital. *S. L.*

TOD, HUNTER FINLAY, M.A., M.B., B.C.(Cantab.), F.R.C.S., 111 Harley Street, W. Aural Surgeon to the London Hospital, Surgeon Throat and Ear Department Paddington Green Children's Hospital. *Elected December* 1, 1902.

C *Turner, Arthur Logan*, M.D., F.R.C.S.(Ed.), 27 Walker St., Edinburgh. Surgeon for diseases of the Throat and Ear Deaconess Hospital, Edinburgh, Assistant Surgeon to the Ear and Throat Department Royal Infirmary, Edinburgh.

Waggett, Ernest Blechynden, M.A., M.B., B.C.(Cantab.), 45 Upper Brook St., W. Aural Surgeon to Charing Cross Hospital, Surgeon to the Throat and Ear Department Great Northern Central Hospital. *C.*

S *Walker, Henry Secker*, F.R.C.S., 45 Park Sq., Leeds. Senior Ophthalmologist and Aural Surgeon to the General Infirmary, Leeds, Lecturer on Ophthalmology and Otology at the Yorkshire College, Leeds. *C.*

WATERHOUSE, HERBERT FURNIVAL, M.D.(Ed.), F.R.C.S., 81 Wimpole St., W. Formerly Surgeon in charge of Aural Department Charing Cross Hospital. *Elected February* 3, 1902.

West, Charles Ernest, F.R.C.S., 132 Harley St., W. Chief Assistant, Ear Department, St. Bartholomew's Hospital. *Elected February* 6, 1905.

Westmacott, Frederick Hibbert, F.R.C.S., 8 St. John St., Manchester. Honorary Aural Surgeon to the Manchester Children's Hospital, Pendlebury. *Elected March* 4, 1901.

Whitehead, Arthur Longley, M.B., B.S.(Lond.), 31 Park Square, Leeds. Honorary Ophthalmic and Aural Surgeon to the General Infirmary, Leeds. *Elected December* 3, 1903. *C.*

Williams, Patrick Watson, M.D., 1 Victoria Sq., Clifton, Bristol. Physician to the Throat Department Bristol Royal Infirmary, Honorary Physician to the Deaf and Dumb Institute.

Williams, Richard, M.R.C.S.(Eng.), L.R.C.P.(Edin.), L.F.P.S. (Glasg.), 82, Rodney St., Liverpool. Senior Surgeon, Liverpool Eye and Ear Infirmary. *Elected February* 6, 1905.

Wingrave, Vitruvius Harold Wyatt, M.D.(Dur.), 14 Stratford Place, W. Physician to the Central London Throat and Ear Hospital. *Elected December* 2, 1901.

Wood, Cyril George Russ, F.R.C.S., Hardwicke House, Shrewsbury. Surgeon to the Eye, Ear, and Throat Hospital, Shrewsbury. *Elected February* 2, 1903.

VP *Woods, Robert Henry,* B.A., M.D.(T.C.D.), 39 Merrion Sq. East, Dublin. Surgeon to the Throat, Nose, and Ear Department, Richmond, etc., Hospitals, Dublin.

S *Yearsley, Percival Macleod,* F.R.C.S., 10 Upper Wimpole St., W. Surgeon to the Royal Ear Hospital. *C.*

RULES AND REGULATIONS.

I.—*Name of the Society.*

The Society shall be called "The Otological Society of the United Kingdom."

II.—*Objects of the Society.*

The objects of the Society shall be:

(*a*) The exhibition and demonstration of patients, models, drawings, and specimens (microscopical or otherwise), illustrating the Anatomy, Physiology, Pathology, and Therapeutics of the Ear.

(*b*) The reading of papers and the discussion of questions in Otology, previously approved by the Council.

(*c*) The investigation by Committees:

(i) Of matters of public importance relating to Otology.

(ii) Of new methods of investigation or treatment of the diseases of the ear.

III.—*Constitution of the Society.*

The Society shall consist of Ordinary and Honorary Members.

The Officers of the Society shall be elected from among the Ordinary Members, and shall consist of a President, not less than two, and not more than four, Vice-Presidents, a Treasurer, a Librarian, an Editor of the 'Transactions,' and two Secretaries, who, with six other Members, shall constitute the Council. At least one fourth of the Council shall consist of Members not resident in London.

IV.—*Election of Members.*

Candidates shall be proposed on a form provided for the purpose, and signed by at least three Members from personal knowledge, who shall state the grounds of their recommendation, which shall be, either

(*a*) Contributions to Otology.

(*b*) The charge of an Aural Clinic approved by the Council.

(*c*) Professional eminence.

The names of those proposed as new Members shall, in the first instance, be submitted to the Council, with whom the power shall rest of declining to allow the nomination to proceed.

The proposal paper shall be read at one ordinary meeting, and the ballot shall be taken at the next meeting.

No election shall take place unless ten Members vote; one black ball in five shall exclude.

V.—*Form of Admission by the Chairman.*

Members shall be admitted personally by the following form, after signing their names in the admission book, and thereby agreeing to abide by the rules of the Society, and paying their admission fee and first annual subscription.

Form of Admission.—"By the Authority and in the name of the Otological Society of the United Kingdom, I admit you a Member thereof."

VI.—*Honorary Members.*

The Council shall have the power of electing men of distinguished eminence in Otology as Honorary Members. The number of Honorary Members shall not exceed six.

VII.—*Expulsion of Members.*

The Council shall have the power of expelling from the Society any Member whose conduct or mode of practice is considered unworthy of the Society. Notice of the Council's intention to expel him shall be sent in writing to the address in the Society's books, and he may appeal to the Society, whose vote, under Rule 8, shall be final.

VIII.—*Appeal.*

A Member who appeals against the decision of the Council, under Rule 7, can be finally expelled only at a General Meeting especially called for that purpose, and of which a written notice shall have been sent to every Member at least fourteen days previously. At least twenty votes must be accorded, and four fifths shall carry the expulsion.

IX.—*Subscriptions.*

There shall be an Admission Fee of One Guinea.

The Annual Subscription shall be One Guinea, payable to the Treasurer in advance at the date of the Annual General Meeting. Any Member whose subscription is six months in arrear shall be reminded of the same by the Treasurer, and if it be not paid within the current year he shall again be reminded by the Treasurer, and if he fails to pay his subscription, his name may be removed by the Council from the list of Members.

X.—*The Election of Officers and Council.*

(*a*) All the Ordinary Members shall be summoned by letter to the Annual Meeting in December, notice being given a fortnight beforehand, and the hour of meeting being stated.

(*b*) The President, Vice-Presidents, Treasurer, Librarian, Editor, Secretaries, and Council shall be elected by ballot at each Annual Meeting, and shall commence their duties on the day following election.

(*c*) One third of the Ordinary Members of the Council shall be replaced in rotation at each Annual Meeting by an equal number of Ordinary Members chosen from the Society at large.

No more than two members on the staff of the same hospital in London shall sit on the Council at the same time.

Only one member of the Council resident out of London shall represent the same city at the same time.

No member of the Society, with the exception of the President, the Treasurer, and the Editor of 'Transactions,' shall serve for more than three consecutive years upon the Council.

(*d*) Balloting lists of the members recommended by the Council to fill the vacant offices shall be prepared by the Secretaries, and forwarded, together with the summons to the Annual Meeting, to every Ordinary Member of the Society.

(*e*) Two Scrutineers, appointed by the President at the commencement of the Annual Meeting, shall receive the balloting lists during the first hour, at the end of which they shall report the result to the meeting.

(*f*) In the event of equality of suffrage the President shall determine by lot.

(*g*) If a Member wishes to propose for ballot any candidate

for office other than those whose names stand upon the list recommended by the Council, the name of such candidate, duly proposed by one Member and seconded by two other Members, shall be sent to the Senior Secretary at least a week before the Annual General Meeting.

(*h*) The Council shall have the power of filling up any vacancies which may occur in any of the offices of the Society between one Annual Meeting and another.

XI.—*The President and Vice-Presidents.*

The President shall regulate all the proceedings of the Society and Council, state and put questions, interpret the application of the rules and regulations, and decide every doubtful point. He shall sign the minutes of General and Council Meetings.

In the absence of the President, one of the Vice-Presidents, Treasurer, or some Member chosen by the meeting, shall perform his duties. The President and Vice-Presidents shall not serve for more than two consecutive years.

Every third President shall, if practicable, be resident out of London.

XII.—*The Secretaries.*

There shall be a Senior and a Junior Secretary elected for each session. The Senior shall retire at the end of each session, and shall, if the Society approve, be succeeded by the Junior. The Secretaries shall have the management of the correspondence of the Society and Council. They shall attend meetings. They shall take minutes, which they shall read at the following meeting. They shall notify to new members their election. They shall have charge of, and keep a register of, all papers communicated.

One of the Secretaries shall, if practicable, be resident out of London.

XIII.—*The Treasurer.*

The Treasurer shall receive all moneys due to the Society, and make up all payments ordered by the Council, keeping an account of all such receipts and payments. He shall keep a printed receipt-book for subscriptions, and every receipt and cheque shall be signed by him. He shall submit to the Council a written Report

of the financial state of the Society, for presentation to the Annual General Meeting. All moneys shall be banked in the name of the Society. The Treasurer shall not hold office for more than five consecutive years.

XIV.—*The Librarian.*

The Librarian shall not hold office for more than five consecutive years.

XV.—*The Editor of the 'Transactions.'*

The Editor of the 'Transactions' shall not hold office for more than five consecutive years.

XVI.—*The Council.*

The Council shall have the management of the affairs of the Society. They shall meet as required during the session of the Society. Notice of the hour of meeting shall be transmitted by the Secretaries to each Member. Four shall form a quorum, and six shall form a quorum when the question of the expulsion of a Member has to be considered. The President, or any three Members, may call a special meeting.

They shall determine questions by vote, or by ballot if demanded, the Chairman having the casting vote. They shall call a special meeting or meetings after the close of the session to determine what communications and illustrations shall be published in the 'Transactions'; they shall make such regulations and issue such orders as shall appear to them conducive to the good government of the Society and to the proper management of its affairs, subject to the Rules of the Society. They shall appoint Investigating Committees as may be required.

XVII.—*The Society's Transactions.*

The Transactions of the Society, under the designation 'Transactions of the Otological Society of the United Kingdom,' shall be published in such manner as the Council may direct. The 'Transactions' shall be presented to all Members of the Society who have paid their annual subscription. No Member whose entrance fee or subscription is in arrear shall be presented with the

'Transactions.' The Council shall be empowered to present, in the name of the Society, copies of the 'Transactions' to such scientific bodies as they may think fit.

XVIII.—*Investigating Committees.*

The Council shall, as occasion demands, appoint Committees of Members of the Society, and, if desirable, one or more non-Members, for the purpose of investigating questions of importance in Otological science, and shall have authority to grant such sums of money as they may deem necessary for the expense of these investigations. The Reports of such Committees shall be presented to the Council to be dealt with as they may deem most advisable. Such Committees shall be called "Investigating Committees": they shall consist of not less than three Members. The Investigating Committees shall continue to act until they have reported on the subject referred to them, or been dissolved by the Council. Every Member who has acted on an Investigating Committee shall sign the final Report, or shall state in writing his reason for declining to do so.

The Report shall be first received and considered by the Council, which may be specially summoned for that purpose, and shall afterwards, with their sanction, be presented at an Ordinary Meeting of the Society.

The Council shall be informed by their Secretary of the retirement of any Member of an Investigating Committee, in which case the Council may at their discretion appoint another Member of the Society to fill the vacancy.

The Investigating Committees shall render to the Council an account of all money received by them for the purpose of their investigations.

The Council shall have the power to dissolve an Investigating Committee whenever they may deem it expedient.

XIX.—*Ordinary Meetings.*

(*a*) The Ordinary Meetings of the Society shall be held on the first Monday, or some other day selected by the Council, at 4.30 p.m., in December, February, March, and May, in London or elsewhere, as the Council may decide.

(*b*) Each Member of the Society shall have the privilege of

introducing a visitor at every Ordinary Meeting, on entering his visitor's name in the attendance-book; but no visitor shall be introduced more than twice in the same session.

(*c*) The business of the Society at the Ordinary Meetings shall be:

(i) The reading of papers and report of cases.

(ii) The demonstration of cases.

(iii) The exhibition and examination of specimens (microscopical or otherwise), drawings, instruments, models, methods of treatment, and the discussion of Otological subjects.

(*d*) At the Ordinary Meetings of the Society nothing relating to its laws or management shall be brought forward.

(*e*) At Ordinary Meetings ten Members shall form a quorum.

(*f*) Additional Ordinary Meetings shall be held if the Council think them necessary.

(*g*) Papers (which must be written in form fit for printing) shall not, as a rule, be of such length as to occupy more than fifteen minutes in delivery. An abstract of each communication, for publication in the Medical Journals, shall be given to the Secretaries before the end of the Meeting at which the communication is read.

(*h*) Members wishing to read papers previously approved by the Council, or show cases, specimens, etc., shall, if possible, give notice thereof to the Secretaries ten days before the meeting.

(*i*) All papers shall be handed to the Secretaries immediately after being read.

(*j*) In any discussion, each Member taking part shall write on a form provided for the purpose an abstract of his remarks, which shall be given to the Secretaries before the end of the meeting.

XX.—*The Annual General and Special Meetings.*

The Annual General Meeting of the Society, for the election of the officers and other Members of the Council, shall be held in December. All proposals to enact, alter, or repeal rules shall be proposed by the Council only at the Annual or Special Meeting of the Society, notice of all such proposals being transmitted to every Member, together with the summons to the Annual or Special Meeting. For the adoption of rules or changes so proposed, the votes of two thirds of the Members present must be in favour of the proposal.

Any Member of the Society may suggest to the Council alterations in the rules, by letter addressed to the Secretaries.

A Special General Meeting may be called at any time by the Council, or at the written request of any ten Members giving at least fourteen days' notice by letter to every Member of the Society resident in the United Kingdom, of the time of meeting and the business upon which it is summoned, and no business shall be entered upon at such meeting except that which has been notified.

XXI.—*Library Regulations.*

(*a*) The Library shall be open at the same hours as that of the Medical Society—viz., from 1 p.m. to 6 p.m. daily, except on Saturdays, when it will be closed at 3 p.m.

(*b*) Members may obtain books at 11, Chandos Street between those hours on signing a book provided for that purpose. But any books or periodicals may be placed by the Council on a separate list, such books not being allowed to be removed from the Library.

(*c*) A book must be returned at the expiration of a fortnight if wanted by any other Member. The Librarian will in such a case write to the Member in whose name the book was taken out.

(*d*) If the book be not returned within four days of such notice, a fine of 6d. will be charged for each day that the book is retained beyond such days of grace.

(*e*) Members resident in the country can obtain books by writing to the resident Librarian and transmitting the cost of postage. Such books are sent at the borrower's risk.

(*f*) A Member taking out a book will be held responsible for its being returned in good condition.

ANNUAL REPORT OF COUNCIL, 1904—1905.

PRESENTED AT THE ANNUAL MEETING, DECEMBER 4, 1905.

In addition to the Annual Meeting and a special General Meeting four Ordinary Meetings have been held in London and one in Manchester. The Council is glad to report that the attendance at all the meetings has been excellent, and that the supply of material for discussion at the Ordinary Meetings has been well maintained, and has only to regret that the time available has often proved too short to enable full justice being done to the communications submitted.

The thanks of the Council are due to the gentlemen who have contributed to the success of the meetings, and especially to Sir Victor Horsley and Dr. Risien Russell for their papers on "Vertigo."

The Council has voted and tendered its thanks to the Victoria University of Manchester, to the Manchester Medical Society and its President, Professor Wm. Thorburn, for their hospitality on the occasion of the holding of the extra-Metropolitan Meeting at that city, and to Dr. Milligan, both for his hospitality and for the work done by him as Hon. Local Secretary in organising the meeting.

A Special General Meeting of the Society was held in February, at which additions were made to the rule bearing on the election of Officers and Members of Council. The Rule as amended will be found in the new volume (VI) of the *Transactions*.

In accordance with its powers the Council has adopted a series of new regulations relating to the manner of making communications to the Society. These regulations will be printed on the back of the date cards for next Session.

The members of the Society number 103. During the Session eleven new members have been elected and two members have

resigned. It is with sincere regret that the Council record the death of one of its original members, Dr. Farquhar Matheson.

At the January Meeting Dr. Barr, in his Presidental Address, warmly advocated the formation by the Society of a permanent museum of otology. This proposal has been repeatedly discussed by the Council, and it has been unanimously resolved "That a permanent Museum of Otology be formed." The President, Mr. Arthur Cheatle, and Dr. Jobson Horne were appointed (as) a sub-committee to consider the best means of carrying this resolution into effect, and were authorised to spend a sum not exceeding £20 for preliminary expenses.

In April the Council received an invitation to appoint one of its members to represent the Otological Society on the "General Committee of Representatives of the London Medical Societies," then about to be formed to consider the question of amalgamation of the societies. Your Council accepted the invitation, and nominated Dr. Urban Pritchard as its representative.

The General Committee of Representatives have since submitted a scheme for bringing about the union of the societies, and have asked your Council among others to say "upon what conditions" the Council was prepared to recommend the Society to join the proposed union.

Dr. Urban Pritchard and Dr. Edward Law were appointed a sub-committee to draw up a reply to this question. The reply formulated by these gentlemen was unanimously adopted by the Council, and will be submitted at this meeting for your confirmation.

Financial Statement of the Honorary Treasurer (Session 1904–1905).

Receipts.

	£	s.	d.
Balance from last year	86	15	10
103 subscriptions	108	3	0
Entrance fees from 11 new members	11	11	0
Subscription from one member for previous session	1	1	0
	£207	10	10

Expenditure.

	£	s.	d.	£	s.	d.
Library expenses	4	4	0			
Rent of rooms	12	12	0			
Printing	92	9	6			
Reporting	5	19	0			
Postage and sundry expenses	6	2	6			
				121	7	0
Balance at bank				86	3	10
				£207	10	10

Report of the Honorary Editor of the "Transactions."

The Honorary Editor of the *Transactions* reported that the volume comprising the Proceedings for the past session was ready for publication. The amount of printed matter it contained was nearly half as large again as that in the previous volume, and the number of plates was nearly double.

Honorary Librarian's Report.

During the past year the usual exchanges were effected with foreign otological societies and the special journals devoted to this branch of medicine.

The following is the list of the journals with which exchanges have been made:

Austro-Hungary.—*Jahrbücher der Gesellschaft der Ungarischen Ohren und Kehlkopfärzte*, Bd. vii, 1901, Budapest, 1902.

Denmark.—*Dansk Oto-laryngologisk Forenings Forhandlingen*, Bd. x, Copenhagen, 1901.

France.—*Annales des Maladies de l'Oreille, du Larynx, du Nez, et du Pharynx*, Paris, 1902; *Archives Internationales de Laryngologie, d'Otologie, et de Rhinologie*, Paris, 1902; *Revue Hebdomadaire de Largngologie, d'Otologie, et de Rhinologie*, Bordeaux, 1902.

Germany.—*Monatsschrift für Ohrenheilkunde sowie für Kehlkopf-, Nasen-, Rachenkrankheiten*, Berlin, 1902; *Centralblatt für Ohrenheilkunde*, Breslau.

Holland.—*Niederländischer Gesellschaft für Hals, Nasen und Ohrenheilkunde*, Amsterdam.

Italy.—*Bollettino delle Malattie dell'Orecchio della Gola e del Naso*, Firenze, 1902; *Archivio Italiano di Otologia, Rinologia e Laringologia*, Torino, 1902.

United States of America.—*Archives of Otology*, vol. xxxi, New York, 1902; *American Laryngological, Rhinological, and Otological Association*, New York.

The Council desires to remind Members that contributions of books, pamphlets, and drawings dealing with matters relating to otology will be warmly welcomed by the Librarian of the Society.

During the past two years the library has been enriched by the addition of many valuable contributions, to which attention has been drawn in the Annual Reports. In spite of this, however, it would appear that Members do not make as much use of the library as its merits demand. Access to it may be obtained by application to the Resident Librarian, 11, Chandos Street, W.

Report of the Museum Committee.

The following letter has been issued, inviting the co-operation of members of the Society in the institution of research work and the formation of a permanent Museum:

11, Chandos Street,
Cavendish Square, W.,
August 31, 1905.

Dear Sir,

The Institution of Research Work and of a Permanent Museum in connection with the Society.

We have been invited by the Council to take steps to give effect to the subjoined resolutions, which were unanimously agreed to at their meeting held on July 1st:

(1) "That a Museum be formed, and that the charge of preparations be taken by Dr. Jobson Horne and Mr. Arthur Cheatle until more permanent arrangements be made."

(2) "That a sum not exceeding twenty pounds be granted to cover initial expenses."

The scope of this permanent Museum will be similar to that of the temporary one formed in connection with the International Otological Congress held in London in 1899. The Museum will include macroscopic and microscopic preparations, drawings, photographs, and models illustrating the physiology, embryology, anatomy, comparative anatomy, and pathology of the ear, the nose, the accessory sinuses, and the naso-pharynx.

We are desirous of learning whether you are willing to make any presentation to the Museum.

We have been asked by the Council to draft a preliminary report to be issued to the Members of the Society at an early date. We shall, therefore, be glad to receive from you at your earliest convenience suggestions for promoting the scheme in hand.

Presentations to the Museum may be forwarded to either of us at the addresses given below. It is requested that a note descriptive of the nature of the presentation may be forwarded in advance.

As soon as possible the exhibits will be arranged for inspection.

Yours faithfully,

Arthur H. Cheatle,
18, Savile Row, London, W;

W. Jobson Horne,
23, Weymouth Street, London W.

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TWENTY-THIRD ORDINARY MEETING.

Monday, December 4th, 1905.

THE PRESIDENT, DR. THOMAS BARR, IN THE CHAIR.

VALEDICTORY ADDRESS.

BY THE PRESIDENT.

GENTLEMEN,—I shall ever look back with pride to the honour you conferred upon me two years ago in electing me as your President, an honour which was renewed a year ago. To be found on the roll of Presidents of the Otological Society of the United Kingdom will be, in my opinion, to occupy no mean place in the annals of our profession.

During these two years, gentlemen, we have not simply been marking time: we have, I venture to say, been moving forwards. The Society has continued to exhibit all the vitality and enthusiasm of youth. At our ordinary meetings there has been no lack of excellent papers and demonstrations, also clinical and pathological material; indeed, it was usually difficult to overtake the entire programme of work. The discussions have, as a rule, been profitable and characterised by a sufficient amount of keenness and liveliness. The Council has been much occupied in deliberating on matters of very considerable moment. The extra-metropolitan meetings in Glasgow and Manchester were notable features of the Society's work—proving the wisdom of having an annual meeting outside London.

The idea of founding a permanent museum in connection with the Society, which was broached at our annual dinner a year ago, has now taken definite shape, and it is hoped that such a museum will eventually constitute an important feature of this Society. Organised pathological research is also in the air, and I believe the future has in store for us important service in this direction.

Gentlemen, I think it is meet and proper that I should here refer to the loss by death of two of our number during these two years. Dr. McKeown, of Belfast, who was elected a member of this Society in 1902, died on July 9, 1904, and Dr. Farquhar Matheson, who was an original member of the Society, passed away on August 23 last. Dr. McKeown was rarely able to attend on account of the distance as well as his much occupied life. I met him occasionally in Belfast, and recognised in him a man of marked individuality, a fearless exponent of what he regarded as right, and much interested in his work. Dr. Matheson was better known to most of us; indeed, he was a very familiar figure at these meetings, much and very widely esteemed, and keenly interested in the work of the Society. We mourn and regret the death of these colleagues, and in regard to each *requiescat in pace.*

Looking to the future, gentlemen, I trust that the desire for progress will continue to stir the minds of the members of this Society, that with those of you who possess the talent for research that talent will not be wrapped up in a napkin, but put to use. Otology presents a great field for further research. The path may be somewhat weary and ofttimes discouraging; the immediate fruit may appear scanty, but he who seeks knowledge for its own sake will be rewarded. In any case, let us keep before our eyes the good of science, the advancement of otology, and the benefit of humanity.

In vacating the chair, I am conscious of many shortcomings during these two years, and I believe that in going so far afield for your President you have been placed, for the time being, at a disadvantage, which you have borne with in the kindliest and most considerate way. If my presidential period marks the initiation of any useful expansion of our work, I would consider myself fortunate indeed.

Whilst ceasing to be your President, I shall not cease to take an interest in the affairs of the Society, and, in the *rôle* of a member of Council or an ordinary member, it will always be my aim to advance the interests of the Society and to promote its usefulness. I have a good example in my immediate predecessor, whose interest in the Society has never waned. Allow me to thank you, gentlemen, for all your consideration and kindness to me during my two years of office.

The Prevention of Ear Affections due to Exposure to loud Noises and to Explosives.

By Arthur H. Cheatle.

I wish to draw the attention of the Society to the ear affections due to exposure to loud noises and to explosives with a view to their prevention.

The nerve-deafness due to the first cause is, as is well known, especially rife among boiler-makers. The number of men affected must be large, and is worthy of investigation by the Society. Dr. Barr investigated the affection among a certain number of boiler-makers in Glasgow, and he read an exhaustive paper on the subject before the Philosophical Society of Glasgow on March 3, 1886.

In considering the prevention, he stated that a well-fitting rubber plug rendered it possible for him to remain inside a flue, while the hammering was going on, with impunity; and he observed that while the plugs were in his ears he was able to hear the voice of a speaker better than when the ears were open. It is clear, then, that proper plugging of the ear would act as a preventive without accompanying prevention of cranial conduction.

The affections due to exposure to explosives occur chiefly in sportsmen, soldiers, and especially in naval men. Sportsmen get nerve-deafness, after continual firing, in the left ear owing to the way in which the head is held. Artillerymen and naval men are both exposed to the same varieties of ear affections, but the latter more so on account of the proximity of the explosions. The ear affections produced by gun-fire in the navy are, in my opinion, worthy of the serious attention of the authorities. It has been noticed that a great number of the naval officers passing through King Edward VII Hospital are more or less deaf, and we must all see them in practice. The officers are more affected than the men, as they are necessarily more exposed during gun practice.

The affections are of several varieties. Occasionally the membrane is ruptured by exposure to the concussion of a large gun, the accident being more likely to occur if the concussion is unexpected. As a rule only one ear is affected, and recovery is usual, but some nerve deafness may be also produced. If infection takes place, an acute inflammation of the middle ear occurs, leading, in some cases, to a chronic suppuration or to acute mastoid trouble with all its attending dangers.

I have lately had under my care an officer who had his left membrane ruptured in a submarine explosion, with subsequent mastoid infection.

Again, the single concussion from a large gun may cause more or less lasting nerve-deafness with hissing tinnitus, usually only on the side exposed, without rupture of the membrane.

The most common cases, however, are those of gradual nerve-deafness, without tinnitus, coming on after repeated exposure to gun-fire. As a rule both ears are affected, but one more so than the other. Deafness is often marked after gun-practice, but recovery occurs after a time; repeated exposure is necessary to procure this lasting deafness.

All the sufferers are unanimous in stating that the smaller guns, with a high-pitched, sharp, penetrating report are the greatest offenders. They usually seek advice as they find that although individual conversation may be easy, yet they are unable to hear at the theatre or in general conversation, especially at the dinner-table, and are thus handicapped socially and domestically. In some the deafness is more serious and interferes with their work.

If these troubles may occur during gun practice in peace time, what would be the aural condition of a crew during and after an engagement, when, besides their own fire, they are also exposed to shell from the enemy constantly bursting on board?

The Japanese are quite alive to the trouble, for Surgeon-General Suzuki, of their navy, lately described how cotton plugs for the ears were served out to every man in the fleet before action. He stated, however, that cotton plugs did not give sufficient protection and that the subject required further investigation (*British Medical Journal*, October 28, 1905).

Prevention in all these cases may be, and in my opinion should be, prevented by efficient plugging of the ears, although it is important that those exposed should be free from any cause which is likely to produce Eustachian obstruction.

With regard to the means for efficiently plugging the ears I should like to ask the opinion of members, and wish to draw attention to a material called "clay fibre" invented by Sir William Dalby. It can be readily moulded to fit any ear, it gives perfect protection, and is easily removed in one piece.

Dr. Herbert Tilley asked what were the results of the treatment by the method recommended by Mr. Cheatle. Only a few hours ago he (Dr. Tilley) saw a case absolutely similar to that

which Mr. Cheatle had described, in which the nerve-deafness was extreme. The patient was a lieutenant on H.M.S. *Excellent*, and he was unable to hear the Galton whistle two inches from the ear. Still, his power of hearing conversation was surprisingly good compared with the degree of nerve-deafness. He would like to hear whether remaining away from gun-firing for any time did any good, also whether the constant current, the administration of strychnia, or counter-irritation were of any use. The prognosis was very important in these cases, because patients often required to know whether it would be necessary to leave the service and seek some other occupation. Had Mr. Cheatle seen a sufficient number of cases in which any kind of treatment had been of benefit, so that one might be guided in giving a prognosis?

Mr. Cresswell Baber said the question of protecting the ear from loud noises often came under his notice. Some time ago he had rubber plugs made filled with sawdust for the use of a revolver shot, and they were described as a great convenience. He had tried them on himself and found them satisfactory for travelling when noise interfered with sleeping. The sound could not be entirely shut out by that means, because sound travelled through the bones of the head. The efficacy of the plug was increased by putting a pad of cotton-wool over the ear. In his experience no treatment did any good in such cases, except that keeping patients away from the noise prevented the condition becoming worse.

Dr. W. Milligan said he had seen many instances of the condition in boiler-makers, but had been very disappointed with every form of treatment which he had tried. Not only was a certain amount of good obtained by plugging the ear by means of such a device as Mr. Cheatle recommended, but also by instructing the patient to keep the mouth a little open by a piece of rubber between the teeth. That seemed to allow of equalisation of atmospheric pressure on both sides of the tympanum. Drugs and other forms of treatment seemed to him to be absolutely useless.

Mr. Harold Mole asked whether there was any chance of boiler-makers and others getting worse after leaving off their occupation.

Dr. Edward Law supported the remark of Dr. Milligan in reference to the patient holding a piece of rubber in his mouth. Last week he saw a naval man, and learnt from him that many officers chewed a tooth-pick when big guns were fired, for they had discovered that in such circumstances the concussion on their ears was much less. He asked whether Mr. Cheatle was not of the

opinion that the membrane rarely ruptured unless it was previously affected by pathological changes.

Mr. Macleod Yearsley remarked on the statement in the paper that when Dr. Barr, the President, experimented with plugs he was the subject of paracusis. That was a very interesting point, because so little was known about paracusis, and it was a question which some of the members might do well to think about and express their opinions upon. Many theories had been offered about it, and there seemed to be a reversion now to one of the older of those views.

Dr. Urban Pritchard said that many years ago he went to Leeds to examine some cases of boiler-makers' deafness at the invitation of Sir James Kitson. He (Dr. Pritchard) published his results, which confirmed the President's remark. In the boiler-makers' shop he could distinctly hear better when he pressed his fingers into his ears. Again, he had observed that when in a rattling cab he could hear conversation quite as well and far more pleasantly by putting the fingers into his ears. Referring to the practice by the Japanese of putting cotton-wool into the ears, it was not very efficacious if put in lightly; but if it were twisted up hard it was much more effective. Seeing the communication in the *British Medical Journal* referring to the Japanese, he (Dr. Pritchard) asked a young naval captain why the same course was not adopted in the English navy, and he replied that it was. Formerly the officers and men would not use it, but now they were doing so. He believed that unless there was a very severe explosion near at hand, rupture of the membrane did not occur without previous Eustachian obstruction. With regard to the deafness itself, formerly he had been occasionally deceived, and therefore ventured to mention that such a case when examined in the quiet of one's consulting room by conversation might seem to hear normally. Then one might say to the patient, "You can hear well enough," and he would reply, "I am deaf." The point was to test him with the high notes of the tuning-fork, which would, of course, reveal the deafness.

Dr. Dundas Grant corroborated the somewhat unfavourable prognosis which had been arrived at by other speakers; but he remembered the case of a locomotive-driver who was improved to some extent by the use of the continuous current, but it was such an isolated case of that kind that there was probably some coincidence. He had only recently heard of the plan of having india-rubber between the teeth during the firing of the guns; it was from a man who did much shooting, who said the india-rubber pre-

vented him from getting the headache which he had previously had while shooting. In one of Dr. Grant's cases the deafness was in the right ear, and it transpired that the man shot from the left shoulder.

Mr. C. H. Fagge said he supposed all otologists had seen cases of naval officers with deafness due to concussion from gun-fire, and he would be glad to hear from Mr. Cheatle whether such patients should be told they were to give up their profession. As regarded treatment, one patient told him that it was a common custom for naval officers to carry about and wear indiarubber shields, very much like the teat of a baby's bottle. He asked whether Mr. Cheatle included in his remarks other explosives than gun-fire. To him it was curious that people who became deaf from shooting almost invariably suffered on the left side. The fact that the left ear was nearer to the gun-nozzle did not appear to be a sufficient explanation, as the difference in the distance of the two ears from the explosion was not great.

Mr. A. E. Cumberbatch thought he recognised in the plugs handed round by Mr. Cheatle an old friend—jeweller's wax, which when placed in the meatus would fit it exactly, and could be withdrawn safely without leaving any behind.

The President asked whether the material recommended by Mr. Cheatle would irritate the meatus. In his own investigations, twenty years ago, into the hearing of the boiler-makers on the Clyde, he found that, when starting work as boys, they put cotton-wool or waste into their ears on account of the *painfulness* of the sound, which concerned them much more than the likelihood of deafness ensuing. In his own case, when inside a boiler with the riveting going on, the sensation in the ear was intolerable and comparable to innumerable needles penetrating the ears. When the youths become accustomed to the sound, which gradually becomes less painful, they no longer use the cotton-wool. If the material brought forward by Mr. Cheatle could be worn without irritation it would be a great boon, not only to those exposed to loud sound at their work, but to persons travelling at night by train or steamer and unable to sleep because of the noise. An objection in regard to ordinary ear-plugs is that purchasers going into a chemist's shop are allowed to try a number to find which may fit the ear. When we consider that such persons may be suffering from purulent ear disease, which may thus infect the discarded plug, one feels that the risks involved of infecting the healthy ear of a subsequent customer are considerable, risks which

would be avoided by the use of such material as Mr. Cheatle had shown to them.

Mr. G. Jackson said he had tried small wooden plugs and had not known them to produce any irritation.

Mr. Cheatle, in reply, said the only treatment which produced real benefit was rest from exposure. The amount of improvement which would ensue depended upon the period during which the patient had been exposed to the noises. If for a long time the condition was not improved, but if only for a short time the condition improved to some extent. Treatment of any sort apart from rest was useless. With regard to prognosis, the deafness did not increase if the patient ceased to be exposed to gun fire. Dr. Law's contention that a drum did not rupture unless it was unsound was probably true, but he (Mr. Cheatle) had seen instances of ruptured drums which had been previously perfectly healthy. He had heard captains and admirals say that if they saw their men with plugs in their ears they would soon have them out. The men often used cotton-waste as a plug if they could obtain it. He interviewed the Director-General of the Navy on the matter many months ago, and he said he had never heard much of it, but he reminded that gentleman that he was the last person to hear of it, because a man who was dependent upon his report for promotion would not state such a defect to him. With regard to the question whether they should give up their profession, some of them were compelled to, and to save the hearing it would be better if they did so. The material used for the plug was not merely jeweller's wax, there was some fibre in it also, to insure none being left behind when it was withdrawn. He had never known it worn for many hours every day but only during gun-fire, and in those cases it produced no irritation. The Director-General asked whether it would enlarge the meatus, but of course he assured him that that would not happen.

Sketch and Specimen of a Case of Necrosis of the Handle of the Malleus.

By Macleod Yearsley.

The patient, a man aged forty-five, complained of ringing tinnitus and slight deafness in the right ear. The noise was not very troublesome, but was worse at night. The symptoms had lasted for two months. No other history could be obtained. There had been no pain, and he denied ever having had a discharge

or receiving any blow on the ear. On examination, the right membrane was dull and thickened, and just below the short process appeared a small piece of brownish substance that had the appearance of wax. Attempts to wipe it off with wool and pick it off with forceps were unsuccessful. Hydrogen peroxide was put in the ear for twenty minutes with the object of loosening the supposed cerumen. On renewing the attempt to pick it away with forceps the necrosed handle of the malleus, of which the jagged upper end had simulated a piece of wax, came out of the membrane as easily as the finger out of a glove. No trouble occurred as regards healing, and the deafness and tinnitus disappeared with subsequent catheterisation. Mr. Yearsley asked if any other member had ever met with a similar case, and whether the Society could offer any suggestion as to the cause.

Mr. Richard Lake exhibited *Skulls showing the different stages of an Operation for opening the Vestibule.*

Stereograms illustrating five Cases of the Radical Mastoid Operation and one of a Polypus attached to a diseased Malleus.

By Kerr Love.

Four of the following cases of the radical mastoid operation were operated on in the wards of the Royal Infirmary, without selection and in the order in which they were admitted, between June 5 and 19, 1905. The fifth case was operated on in the Queen's Park Home, on September 17, 1905. The cases are brought together because they were used for the production of stereoscopic pictures of the radical operation. The cases have nothing in common except that they all seemed to me to require the operation, and were cases of chronic middle-ear suppuration which had long resisted non-operative treatment.

Two were chronic middle-ear suppurations, which had not been treated, but in which acute mastoiditis developed. One was a mastoid periostitis following an acute middle-ear suppuration. In all the radical mastoid operation was conducted on the same lines, and in all healing and the cessation of discharge took place in from four to nine weeks.

Case 1.—J. H——, aged sixteen, transferred from a medical ward to the ear ward with mastoid tenderness and a history of

chronic middle-ear suppuration in left ear, lasting since childhood. On the medical side she was under treatment for fits. Operation, June 6: Mastoid process sclerosed with a little pus in a deeply-placed antrum. Necrosed incus removed. Healing complete in four weeks.

Case 2.—J. O'B——, aged twenty-one, admitted from out-patient department with mastoid tenderness, copious discharge from right ear, and a polypus protruding from the external auditory canal. Duration of disease nineteen years. Operation, June 12: Mastoid cells well marked, filled with granulation masses and pus. Healing in nine weeks.

Case 3.—J. B. S——, aged eighteen, admitted June 10, with sinus on mastoid process of right side. A few days before an abscess was opened at the out-patient department, but as the bone seemed swollen and as the discharge was copious pus in the cells was suspected. Operation, June 15: Nothing found in the cells or antrum.

Case 4.—A. McG——, aged nine, has been under my care since March for chronic suppuration of the right middle ear. On March 17 I removed post-nasal adenoids, as well as granulation masses which were protruding through the posterior superior quadrant of the right tympanic membrane. Epidermic masses were also removed from the left ear. The disease dated from an attack of scarlet fever four years ago. As continuous treatment till May did not cause healing, and as the granulation masses recurred, I advised operation. Operation, June 19: Mastoid cells found to contain pus, and the antrum granulation masses. Healing and cessation of discharge took place in seven weeks.

Case 5.—C. C——, aged four, has been under my care for a year for chronic middle-ear suppuration, which commenced when she was a year old. There were two perforations—one just behind the malleus, over the incus, which was necrosed, and one in front of the malleus. At first the discharge greatly diminished, and indeed almost ceased, but in time a granulation mass developed, and hung from the roof of the middle ear. Operation was therefore decided upon. Operation, September 17: Mastoid cells very well developed. Before opening the bone a blue discoloration shone through the otherwise normal bone-surface, and when the

cells were opened they were filled from the tip of the process to the zygoma and back to the sinus mastoid wall with dark-red granulation masses. Healing and cessation of discharge took place in seven weeks. The large cells filled with diseased products at four years is noteworthy.

The stereograms are meant to display the steps of the radical operation from the making of the post-auricular incision to the stitching up of the same. A drainage-tube is kept in the external auditory canal for a week, but the wounds are never packed, and no syringing, nor spirit drops, nor medicament of any kind is used. After the first two dressings, when the tube is removed, the deeper parts are carefully dried out with fine cotton tips, but the syringe is never used. Skin-grafting was not adopted in any of the cases.

The President remarked on the interest which the members felt in Dr. Kerr Love's stereograms, and said he was impressed by the rapidity of the healing in these cases. The absence of packing was also an important point. Had there been time, it would have been profitable to have had an interchange of views on this and other matters in connection with these cases.

A Case of Acute Otitis Media Suppurativa, with prolonged high Temperature, but without other serious Symptoms.

By Harold Mole.

On October 26, 1904, I was called to Weston-super-Mare by Dr. E. F. Martin to see A. D——, aged nine, with a view to operating on his mastoid. He had then a discharge from his right ear, a temperature of 104° F., slight facial paralysis on the right side, and enlarged glands the same side of the neck. The history was that ten days previously he had had an earache but that it got better; he went to the baths, the earache returned, and four days ago the drum burst and a discharge took place. The pain in the ear was never severe. Two days ago the temperature, then taken for the first time, was 104° F., with a profuse discharge from the ear. When I first saw him the upper posterior part of the right drum was bulging considerably, and there was a small perforation in the centre of the bulging portion. The discharge was slight, and there was little or no pain. I could not detect any tenderness over the mastoid, the side of the head, or the neck, except a little in the latter situation in connection with the enlarged glands. There was no indication of pneumonia or any acute specific fever, and the boy

did not look particularly ill. Under an anæsthetic I freely incised the drum posteriorly through the bulging portion and perforation, and requested that two leeches be put on the mastoid behind the auricle, and that a Widal examination of the blood be made.

On October 28, two days later, I was again called down to see the patient as the evening temperature still remained high. The facial paralysis was more marked, but the boy seemed no worse, there was very little discharge from the ear, and the incision in the drum had partly healed. There were still no localising signs. The Widal was negative.

On November 2 I was summoned for the third time, as Dr. Martin thought he had elicited tenderness over the mastoid process. The evening temperature was still high, but on looking at the chart there was a general tendency towards defervescence. I could not myself discover any mastoid tenderness, and for the third time I declined to operate. I subsequently heard that he quite recovered, that his facial paralysis cleared up, and that his hearing became normal.

Here was a boy whose illness commenced with earache, never at any time severe, followed by perforation of the drum, and whose temperature at the first taking was 104° F., and remained in the evening between 103° F. and 104° F. for a week, gradually subsiding by lysis at the end of about three weeks. There was facial paralysis from the first but there were never any rigors, never tenderness over the mastoid or side of the head, or along the jugular vein in the neck, and with the exception of the continuous high temperature, there was nothing to indicate any serious complication of otitis media. As the sequel has shown, I was right in not operating; but I found it very difficult to resist the views of the practitioners with whom I saw the case, and I did at one time think it possible there might be an extra-dural abscess. But the boy's aspect did not suggest it; in fact, he never looked as though there was anything very serious the matter with him when I saw him; and had it not been for the thermometer I think the case would have passed as an ordinary uncomplicated acute otitis. The early facial paralysis was probably accounted for by a dehiscence in the wall of the facial canal. The only diagnosis I was able to suggest was influenza. As I have before mentioned, there were never signs of any of the other specific fevers, and I feel fairly confident that the aural condition was not the cause of the pyrexia.

Mr. Cresswell Baber asked whether there was a history of influenza before Mr. Mole saw the child. If not, it would seem

that the attack was due to the bathing. No doubt Mr. Mole's explanation of the facial paresis was the correct one. In cases of acute otitis he (Mr. Baber) had found great benefit for many years from the drops recommended in the book of the President, consisting of cocaine, carbolic acid, and glycerine, and that a cure resulted from them in some cases in which he thought he would have to operate. He would be glad to hear whether the boy's hearing had completely recovered.

Mr. Yearsley said one's general experience was against the diagnosis of influenza in this case, for when influenza attacked the middle ear with suppuration it was more severe and caused greater destruction.

Dr. Dundas Grant remarked that Mr. Mole did not state what was the appearance of the membrane the last time he saw the case, when there was suspicious mastoid tenderness. If the appearance of the membrane continued fairly normal, and the incision was nearly healed, he was probably justified in taking up the expectant attitude which he adopted. If, however, there was persistence of suppuration to any extent, probably drainage of the mastoid cells would have been more advisable.

Dr. A. Bronner asked whether there was intense pain, as in most cases of purulent otitis media due to influenza the pain was much more severe and lasted longer than in ordinary cases.

Mr. C. E. West asked whether any culture had been taken from the discharge.

The President said his experience was that influenza accounted for many of the cases of empyema of the mastoid cells supervening upon acute purulent otitis media. The temperature in the case was high for simple otitis media, although in certain temperaments it might rise to 103° or even 104° F. Occasionally facial paralysis occurred in ordinary acute otitis media and passed off, and was then probably due, in many cases, to the nerve in the Fallopian canal being partially uncovered by bone, perhaps from faulty development, the neurilemma of the nerve being in contact with the mucous membrane of the middle ear, and being thereby involved in the inflammation of the latter.

Mr. G. Jackson asked whether there was any throat mischief to account for the condition.

Mr. Mole, in reply, said no culture had been taken from the discharge. He admitted the previous history was imperfect, but the boy was in a convent school, and Dr. Martin was not called in to the case until late. No history was obtainable except that there

had been earache, and the symptoms came on after going to the bath. There was nothing wrong in the throat. With regard to the diagnosis, he thought for a high temperature to persist for two or three weeks in a boy, with but little discharge from the ear and no other symptoms, was rather unusual. He had seen several cases of influenzal otitis media which did not bear out the remarks of Mr. Yearsley. There was an outbreak of the condition amongst nurses at the Bristol Royal Infirmary, which he had seen, and the cases cleared up in the way in which acute otitis media ordinarily did when seen and treated early. Last time he saw the boy there was scarcely any sign of perforation. There was never any really acute pain; indeed, it was more like that of tuberculous trouble.

Notes on a Case of Severe Vertigo, due to Aspergillus of the External Auditory Meatus.

By Adolph Bronner.

Cases of aspergillus of the external auditory meatus are not common in this country. The case which I saw some months ago also presented some rather unusual symptoms. Mr. V——, a man aged about fifty-five, consulted me in October, 1904. He had noticed slight increasing deafness of the right ear, with intense tickling, for two or three months. During the last three weeks he had intermittent tinnitus, chiefly buzzing noises, and frequent attacks of severe vertigo. The latter were generally of short duration, one to five minutes, but sometimes they lasted for two or three hours. They came on quite suddenly. A few times he was violently sick. The walls of the meatus were covered with a grey-black skin, which partly obscured the membrana tympani. The skin was removed by the forceps and syringe. The surface of the drum was dark and irregular, and there was evidently much proliferation of the epithelium. A loud-ticking watch was heard at five inches. The tuning fork tests were nearly normal, both by bone and air-conduction. The skin was examined and it was found to be a case of Aspergillus niger. Ear-drops of absolute alcohol were ordered. When I saw the patient ten days later the hearing was much better; the watch was heard at thirty inches; he had had no more attacks of vertigo or tinnitus. After the use of the Eustachian catheter the hearing became practically normal.

Dr. Kerr Love handed round photographs of the aspergillus from the middle ear, in illustration of Dr. Bronner's contribution.

Dr. Urban Pritchard suggested as regarded treatment the

addition of 1 in 1000 of biniodide, or perchloride of mercury, to the alcoholic instillation used.

Mr. Richard Lake showed *Specimens and Drawings of a Case of Aspergillus Niger.*

Case of Chronic Inflammation of the External Auditory Meatus on both sides, with marked Stenosis.

By W. H. Kelson.

Dr. W. H. Kelson showed a woman, aged thirty-nine, who for eleven years had an intermittent discharge from both ears and in whom the external auditory meatus was markedly contracted. The lower parts of both auricles had an eczematous appearance and were thickened, but patient had not suffered from eczema on any other part of her body; the lumen of the external auditory meatus on each side was reduced to a pin-hole opening through which it was impossible to get a view of the membrana tympani. The patient was steadily becoming deafer to aerial conduction, but bone-conduction was good; on inflation by Eustachian catheter no sound indicative of perforation could be heard.

TWENTY-FOURTH ORDINARY MEETING.

Monday, February 5th, 1906.

THE PRESIDENT, MR. A. E. CUMBERBATCH, IN THE CHAIR.

The following gentlemen were elected as ordinary members:

John Stoddart Barr, M.B., Ch.B.Glasg. (Glasgow).
Henry John Davis, M.A., M.B., B.C.Cantab., M.R.C.P.Lond. (London).
Alec. Knyvett Gordon, B.A., M.B., B.C.Cantab. (Manchester).
H. Fitzgerald Powell, M.D., F.R.C.S.Edin. (London).
Edward Simmons Stewart, F.R.C.S.Eng. (Harrogate).

PRESIDENT'S ADDRESS.

My first duty is to thank you for the honour you have done me in electing me your President. It is an honour I appreciate so highly that, conscious though I am of my shortcomings, I have, after some hesitation, accepted it. At all times it is a difficult task to fill a presidential chair worthily, and my difficulty will not be lessened by the knowledge of the high standard of efficiency set by my predecessors. I can, however, but do my best, and would ask you to "be to my faults a little blind," and to lend me your best assistance in endeavouring to make our meetings as successful as they have hitherto been.

This year promises to be an important one in the history of the Society, and in any case will be a troublesome one for your Council. I refer, of course, to the "amalgamation scheme." It will require extremely skilful management to negotiate the many rapids ahead and to pilot the undertaking into smooth water. From what I hear matters do not appear to be progressing either rapidly or quite satisfactorily. I feel sure we are all unanimous that if we do consent to be a section of a larger society, we shall only consent on the understanding that the management of our section is left in

our own hands, and not in those of a general committee which can know but little of our aspirations and aims. You may rest assured that the Council will consent to no scheme without first laying the particulars before the members of the Society and obtaining their sanction.

Gentlemen, the exceptional success of our Society so far reminds me that in the history of all successful concerns there is apt to occur a time when there is a tendency to slackness, to take things easily, to drift into mere routine. I am not for a moment saying we have reached that period, but it is well we should remember there is that danger and be on our guard. We must constantly strive in every paper read before the Society, in the notes of every case shown, that there shall be at least some one point which shall suggest food for reflection or give rise to discussion tending to increase our knowledge of disease or to improve our methods of treatment.

I would, therefore, point out to those possessing the time and opportunity what a large field of research is open to them in affections of the labyrinth. In this direction I note with pleasure that Dr. Gray is devoting his attention. We want to know more of the anatomy, physiology, and pathology of this organ, and as regards its pathology not merely the conditions found, but their relations to symptoms. There can be no important advance in treatment till we are able to differentiate the conditions that we vaguely classify under the head of Nerve Deafness, and he is indeed a benefactor who helps in any degree to dissipate the mist that enshrouds the subject.

The following communications were made:

Patient, Drawing, Macro- and Microscopic Specimens of a Case of Epithelioma of the Pinna.

By Macleod Yearsley.

W. T——, aged fifty-two, a porter, applied at the Royal Ear Hospital on December 13, 1905. Two months before he noticed a small nodule in the left pinna, which felt like a shot in the skin. This growth enlarged and ulcerated after one month. On examination a hard, raised ulcer, about the size of a sixpence, was found situated in the fossa of the antihelix. Its appearance was fairly well shown in the sketch. There was no glandular enlargement discoverable.

On December 19 the whole pinna was removed with the exception of the lobule, taking small flaps from the anterior and posterior surfaces of the concha. These were united above and behind, and their lower edges adapted to the cut surface of the lobule. Recovery was uneventful. The patient's urine was acid, sp. gr. 1032, and contained much sugar. Microscopically the growth proved to be an epithelioma.

Case of Abnormal Colour of Membrana Tympani; shown for Diagnosis.

By Macleod Yearsley.

F. F—, aged seventeen, a barman, applied on December 22, 1905, on account of slight deafness and buzzing in the left ear, which symptoms had been present for about eight months. A small amount of cerumen, dead epithelium, and hair was syringed out, and the appearance of the left membrane was noted. The right membrana tympani was normal, but the left presented a totally different aspect. It was of a deep greyish blue or slate colour and of good lustre; it appeared fairly normal save in colour. With the Siegle pneumatic speculum the excursion of the malleus appeared slightly less than normal. Catheterisation made no difference to the hearing or to the appearance of the membrane, and the sound heard was that of a normal Eustachian tube. No adventitious sounds, such as a venous hum, could be detected with the diagnostic tube. The results of the testing were as follows: Acoumeter, R. over 12 feet, L. 3 feet. Ordinary conversation, R. over 12 feet, L. 1 foot 6 inches; whisper, L. 2 inches. C. fork, Weber pos. L. Rinné's test; R. pos. for C. and $C._2$ L. neg. for C. and C_2. Bone-conduction was not diminished or increased in either ear.

The President said the second case was certainly interesting, and it would be instructive to know if any member had met with a similar case. The colour could not be due to venous congestion, because the membrane had not lost its bright polish.

Dr. Urban Pritchard remarked, in connection with the first case, it could not be too well borne in mind that perhaps epithelioma of the auricle was more favourable in prognosis after operation than when it occurred anywhere else in the body. He remembered one exceedingly bad case in which the auricle and cartilaginous meatus were removed. The growth extended into

the meatus, and yet there was no return after the operation, though he traced the patient five years afterwards. In regard to the second case, he remembered the pictures of blue membranes which were shown by Dr. Rohrer, and at which many seemed inclined to laugh. But certainly the present case made one think twice as to whether the exhibitor of those pictures was not right. It was not at all satisfactory to examine such a membrane as the present one by electric light; only daylight could enable the exact colour to be seen. The blueness could not be due to venous blood in the cavity behind, as the hearing was so good.

Mr. Arthur Cheatle asked whether Mr. Yearsley had inquired as to any syphilitic history in the first case. One could easily confuse syphilitic with epitheliomatous conditions in that region. He had known cases which had been microscoped and thought to be epithelioma, but which nevertheless had got well under the administration of iodide of potassium. The case alluded to by Dr. Pritchard subsequently died of acute mania, and he had known of other cases of malignant disease of the ear dying in the same way.

Dr. W. Milligan said, in regard to the first case, a very important clinical fact was that in cases of malignant disease of the auricle there was, as a rule, late enlargement of glands. That fact might substantiate what Dr. Pritchard said about the favourable nature of such cases for operation and the rarity of recurrence of malignant disease in this situation. He (Dr. Milligan) did not regard epithelioma of the auricle as a very rare condition. A fair number of such cases had been seen at his hospital, and a curious point about some of the cases was that epitheliomatous degeneration had followed upon injury. Two years ago he recorded the case of a patient who was injured by a chisel which flew up and cut his auricle nearly across, and a few months afterwards he developed malignant disease in the scar. He would like to hear if Mr. Yearsley had noticed the clinical fact about the late involvement of glands in such cases.

Dr. Jobson Horne thought it was necessary for the sake of the "Transactions" to be very clear about cases of supposed malignant disease. Some of the cases which had been brought before the Society as malignant had turned out to be innocent on examination by the Pathological Committee. He suggested, if Mr. Yearsley were agreeable, that the present specimen should be submitted, together with a portion of the tissue itself, so that the Committee might cut its own sections.

Dr. Edward Law asked whether it was not possible that the

second case had been subjected to instillations of nitrate of silver, bismuth, or lead, in early life.

Dr. Albert Gray asked whether there was any possibility of attributing the second case to coal-dust having got into the tympanum. A medical friend of his had seen two cases which he attributed to that cause, the dust having got up the Eustachian tube.

Mr. Richard Lake expressed the opinion that the case might be due to the enlargement of the jugular bulb. One knew of the investigations carried on by Mr. Anderson, of St. Thomas's Hospital, in the early eighties, who found a very fairly large proportion of cases in which the jugular bulb was quite high up in the internal wall of the middle ear. In many of those cases there was not even a thin covering of bone. He (Mr. Lake) had shown a case before the Society in which the membrane was exposed and seen to be pulsating, and the blueness was very evident. Obviously in that case there was a very high jugular bulb, with no bone in front. In reference to the first case, he had been struck, in reading reports of X-ray work, how very amenable to treatment malignant growths on the ear appeared to be. He would be inclined to subject such a case to X-ray treatment.

Mr. Sydney Scott said he had a specimen with a bulging jugular bulb similar to that referred to by Mr. Lake. In this specimen the wall of the bulb formed part of the floor and inner wall of the middle ear, with a very thin flake of either bone or calcified material adherent to the middle of the tympanic surface of the bulb. He had never seen such a case of blue membrane as the present one; but he had examined the present case and no blueness was discernible in the region of the membrana flaccida. The intensely dark blue portion was over the lower part and middle of the membrane, in the exact region in which the jugular bulb would bulge outwards most prominently. He asked whether the jugular vein had been compressed during otoscopic examination, and, if so, had it produced any effect on the appearance of the membrane?

Dr. Watson Williams desired to ask those who thought the case was due to the jugular bulb how they explained the blueness of the membrane. Was it suggested that the colour showed through? The patient appeared to have good hearing, and this surely negatived the possibility of an abnormal jugular bulb being in contact with the posterior surface of the ear-drum.

Mr. Arthur Cheatle said he had seen many hundreds of

specimens, including many high jugular bulbs, but never one extending higher than the round window, whereas the present appearance went up to Shrapnel's membrane.

Mr. Yearsley, in reply, said the question of syphilis was carefully gone into, but he could not get any history or evidence of it. He did not regard epithelioma of the pinna as very rare. He had recently been collecting records of cases. The text-books said epithelioma of the ear was rare and sarcoma rarer. Sarcoma certainly seemed rare; in the statistics of the Glasgow Ear Hospital quoted by Connal at the Otological Congress in 1899 it was stated that out of 15,000 cases there were ten of malignant disease of the ear, six of which were epithelioma and four sarcoma. Judging by the records which he had been looking up recently, it seemed very uncommon to find glandular enlargement unless the case had become very bad indeed. He was quite willing to have the specimen examined by the Pathological Committee, but suggested that they should see the section which was already cut before cutting the specimen which had been put up. In answer to Dr. Law concerning the second case, no instillations had been used, and he could not obtain any history of previous treatment having been employed. In reference to the suggestion of coal-dust as a cause, he thought that if that had been so there would have been dust in the other ear also, but it was free. He had not compressed the internal jugular vein. He believed the membrana flaccida was normal, and the blueness was chiefly on the anterior half of the posterior inferior quadrant of the membrane. But if it were an enlarged jugular bulb would the sound of the Eustachian be as clear as he could assure members it was? Also, would there not be a venous hum with the diagnostic tube? He thought those conditions were arguments against it being a jugular bulb.

Demonstration illustrating Pathological Conditions found in the Human Labyrinth.

By Albert A. Gray.

(1) Slide showing a calcareous deposit in the common limb of the superior and posterior canals. There was no affection of hearing nor any disturbance of equilibrium during life. The subject was nineteen years of age at death.

(2) Slide showing calcareous deposit in the left vestibule. The

subject had suffered from deafness and giddiness several years before death.

(3) Slide showing the right ear from the same patient.

(4) Slide showing vestibule and canals from a case of suppurative disease of the labyrinth. No clinical history was obtained beyond the fact that the patient was deaf in the affected ear. No history of disturbances of equilibrium was remembered by the patient's friends.

(5) Slide showing the cochlea from the same case. The soft structures have for the most part been destroyed.

(6) Slide showing the labyrinth from a case of otosclerosis (*vide Brit. Med. Journ.*, November, 1905). Calcareous deposits are to be seen in the lowest whorl of the cochlea. This fact was referred to in the original paper.

Demonstration illustrating the Comparative Anatomy of the Labyrinth of the Mammalia.

By Albert A. Gray.

(1) The membranous labyrinth of the Beisa antelope. The slide showed the typical labyrinth of the ungulates. The cochlea is flattened like that of the human subject. There is a very small perilymphatic space in the semicircular canals.

(2) The membranous labyrinth of the sheep. There is but little difference between this and that of the antelope. Both are typical ungulates.

(3) The membranous labyrinth of the pig. It differs from the other ungulates in the fact that there are three and a half turns in the cochlea. There is a slightly marked perilymphatic space in the semicircular canals.

(3 *a*) The membranous labyrinth of the puma. The slide showed the typical labyrinth of the carnivora. The cochlea is of the pointed type, and there is practically no perilymphatic space in the canals.

(4) The membranous labyrinth of the cat. Typical carnivora.

(5) The membranous labyrinth of the mouse. The slide showed the organ as found in the rodents.

(5 *a*) Labyrinth of the dancing mouse.

(6) The membranous labyrinth of the porpoise. The slide showed the typical labyrinth of the cetacea. The canals are very small, while the cochlea is large. There are one and three quarter

turns in the cochlea. Otoliths of a somewhat large size are to be seen in the vestibule.

The PRESIDENT, in the name of the Society, thanked Dr. Gray for the valuable series of specimens and photographs he had shown.

Mr. YEARSLEY asked how many dancing mice Dr. Gray had examined. He (Mr. Yearsley) recently came across Cyon's researches which were published in Pflüger's *Archiv für die Gesammte Physiologie*, Bd. lxxix, Heft 5, p. 211, 1900, "Ohr Labyrinth, Raumsinn und Orientung." He there stated distinctly that the dancing mouse had only a single semicircular canal developed, namely the superior. After describing what he termed their "furious and interminable waltzes," he said that between times they slept or ate. They danced especially at night, and it was especially the smell of their excrement which excited them to dance. The record then went on to say that they were almost deaf, only hearing the very high tone of their own voice. When their noses were closed with collodion they stopped dancing. Every obstacle stopped them; they could not climb on an inclined plane of 45 degrees by day, but were able to do it by night. Cyon established therefrom some connection between vision and the vestibule, and suggested vision gave them vertigo. He pointed out that pigeons with injured semicircular canals could, after a time, orient themselves by means of vision, but that if they were blinded they lost their equilibrium again. When dancing mice were blinded with collodion they ceased their normal movements and began to turn somersaults in every direction, losing equilibrium like pigeons which had been operated upon. Cyon stated the mice had then to be kept in a hammock to prevent them injuring themselves. They lost the faculty of dancing and made movements which they never made in the normal condition. Although artificial blinding so upset those animals, yet in the normal state they danced perfectly well by night. He (Mr. Yearsley) was under the impression that Cyon's remarks did not agree with the observations of others, especially as to the condition of the labyrinth, and he would be glad to hear if Dr. Gray could give any additional information on the subject. The dancing mouse was simply a domestic variety of the common house mouse (*mus musculus*), and any diversity of opinion might be due to the fact that they were comparable to deaf mutes (human), and consequently exhibited a variety of pathological conditions. Therefore he had obtained the mice which he exhibited in order that Dr. Gray might prepare their labyrinths.

He added that these mice seemed perfectly able to move in a straight line forwards or backwards, that they could climb and feed like normal mice.

Dr. URBAN PRITCHARD said he was particularly interested in labyrinthine research, because he had worked at it from a different point of view. Like man, the monkey had an increased number of [illegible] as one ascended the lamina spiralis. The number of turns of the cochlea varied very much. The least number was in the duck-bill, [illegible] which was exceedingly flat, and made about one turn and a half. The dancing-mice waltzed round in all directions. One would never expect that the semicircular canals were affected simply from observing those animals. It had been suggested that the cause [illegible] was inherited and accentuated in succeeding generations.

Dr. EDWARD LAW asked whether their behaviour had been observed in the presence of a common cat. Did they waltz or run away from the cat under such trying conditions?

Dr. GRAY, in reply, said he had examined two normal mice and one dancing mouse, both ears. With regard to the number of turns in the cochlea, he had not examined the duck-billed platypus, and had not one to show on the present occasion; it was in course of [illegible] which he would gladly exhibit afterwards. The canals of the porpoise were not much larger than those of the mouse. There were two otoliths in the vestibule. He was procuring the labyrinth [illegible] the monkey was similar to that of man, he only meant in macroscopic [illegible] was almost identical with that of man in appearance.

A CASE OF ALMOST COMPLETE OCCLUSION OF THE MEATUS, THE RESULT OF AN ACCIDENT.

BY L. A. LAWRENCE.

R. B—, aged 66, was admitted lately to the Seamen's Hospital, suffering from insomnia and tinnitus and headache of a severe [illegible]

During the short time he had been in the hospital he had been treated with iodide of potassium in 20-grain doses. All his symptoms had passed off, and his condition was as follows: Hearing, watch, R. ½ in., L. 1½ in. Tuning-fork, Rinné-Weber, R. Bone conduction normal. Left ear, fairly normal to look at. Right ear, nearly complete stenosis of the meatus, a mere pin-point opening, through which a little fluid exuded. The tinnitus was still present, but the staggering gait and insomnia had left him; the knee-jerks were present on both sides, perhaps more pronounced on the right side. Mr. Lawrence desired suggestions for treatment.

Dr. Grant asked how far the narrowing was found to extend by means of a bent probe—it might be possible to dilate it by a tent and then examine it further—also whether the deafness were due to a change in the internal ear.

Mr Secker Walker said the chief difficulty in these cases was the liability to recurrence of the contraction in the meatus. He thought the best results were obtained by making a post-aural incision, turning the ear forward, and dislocating the cartilaginous tube, excising the cicatrix, and then after splitting the floor to turn up the posterior wall of the tube and suture it into the mastoid flap, as is done in the complete mastoid operation. In this way subsequent contraction was entirely avoided.

The President thought something should be attempted in the case, because though on first examining the patient the ear looked dry, on pressing in the speculum a distinct bead of pus welled up through the minute opening. Therefore some exploration should be made, the subsequent course being decided on seeing the condition of things present.

A Case of Malignant Growth originating in the Skin over the Mastoid Process.

By W. Milligan.

E. V—, female, aged nineteen, was referred to Dr. Milligan by Dr. Nichol of Llandudno on November 29, 1905. For the previous twelve months she had been progressively losing strength and weight, and had suffered severe pain in and behind the left ear. Upon examination a growth fully the size of a tangerine orange was found springing from the tissues over the left mastoid process,

involving the lower one third of the external ear and extending deeply into the tissues of the neck behind the ravines of the jaw. The growth was hard to the feel but was not fixed. An area of about the size of a shilling was superficially ulcerated, and from this frequent attacks of spontaneous hæmorrhage were common. There were two or three enlarged glands to be felt upon deep palpation behind the posterior border of the sterno-mastoid muscle. The patient stated that twelve months previously a growth had been removed from the same situation, and that at the time of removal its size was about that of an ordinary red marble. Recurrence had, however, taken place almost immediately, and the growth had become gradually larger until it had attained its present size. An opinion had been expressed that the growth was inoperable. Against this, however, was the fact that the growth was not fixed, that apparently only a limited area of lymphatic infection was present, and that the patient was in fairly good condition. The dangers accompanying any attempt to remove the growth were pointed out to the parents, who decided that an attempt should be made to remove it. Under chloroform incisions were made in front of and behind the growth, and well away from the diseased tissue and meeting below. The lower half of the external ear was cut across, and after a long and tedious dissection the growth was removed. In doing so the carotid sheath was exposed and three deep-seated glands removed. In dissecting the growth from under the parotid gland some fibres of the facial nerve were cut through, with the result that there was subsequently marked drooping of the angle of the mouth upon the affected side. A most elaborate toilet was performed, including a careful cleansing of the carotid sheath and of all areolar tissue which could be laid hold of and dissected away. Recovery was quite uneventful, and upon the fifth day the patient was sitting up in bed.

Microscopically the growth was seen to be carcinomatous in structure, and from the appearances presented by the epithelial elements it probably originated in the sebaceous glands of the skin covering the mastoid process.

The situation of the growth, its structure and microscopic appearances, together with the age of the patient and the absence of any definite exciting cause, made the case peculiarly interesting.

Dr. Jobson Horne suggested that the growth might be examined by the Pathological Committee.

Notes of Three Cases of Cerebellar Abscess.

By L. A. Whitehead.

Suppuration in the temporal bone may extend backwards into the posterior cranial fossa along three paths—through the lateral sinus, through the labyrinth, or through the triangular area of bone bounded above by the superior petrosal sinus, in front by the posterior semicircular canal, and behind by the lateral sinus.

The relative frequency with which the infection spreads through the last-named area is of considerable clinical importance, and an investigation of twenty-three cases of cerebellar abscess which have occurred in the Aural Department of the General Infirmary at Leeds during the last few years shows that in nine cases the path of infection lay through the area above mentioned, the lateral sinus and internal ear being unaffected.

Three cases of cerebellar abscess have come under my care during the last few months, and two of these show the importance of a careful investigation of the condition of the bone in this locality.

The first case was that of a child aged five years. For two years there had been continuous otorrhœa on the right side, for fourteen days there had been headache, pain in and about the ear, and for two or three days drowsiness, with some tenderness over the mastoid process, but no vomiting, convulsions, or any affection of the eye, trunk, or limb-muscles.

When first seen the temperature was 99° F., pulse 96, and respirations 27. The auditory canal contained foul pus, and the middle ear could not be seen owing to the depression of the superior meatal wall.

The radical operation was performed and extensive bone-disease found. The disease extended backwards through the triangular area above mentioned, and a small extra-dural abscess was discovered. Further search revealed a small, ragged perforation in the dura mater communicating with an abscess in the cerebellum containing about 2½ drachms of pus. The dura was more freely opened and the abscess cavity drained. The drowsiness and headache passed off in two days, and the further progress of the case was uneventful and completely satisfactory.

The second case was that of a girl aged sixteen. When five years old she had measles associated with corneal ulceration and otorrhœa. Both eyes were quite destroyed by the corneal suppura-

tion, and although the left ear ceased to discharge otorrhœa persisted from the right.

Four days before her admission into hospital she had a convulsion, with loss of consciousness, lasting two or three minutes, and during the following days she remained heavy and drowsy, with occasional attacks of vomiting. During the six hours preceding her admission she became rapidly worse, and when admitted was almost moribund and quite comatose.

There was an offensive right otorrhœa, but no external mastoid signs, no nystagmus, no paralysis or rigidity of the limbs, and the knee-jerks could not be obtained.

The radical operation was performed, and on removing the cortex extensive disease was found. The bone was almost black and the pus very offensive. The disease extended back through the triangular area, and a small extra-dural abscess was found. The cerebellum was explored and an abscess, containing about a drachm and a half of pus, opened and drained. Consciousness was never regained, and death occurred ten hours later.

Both these cases clearly demonstrate the importance of a careful search, in all cases of temporal bone disease, of the triangular area above indicated, and the frequency with which infective processes will select this track.

The third case is of considerable interest since both the temporo-sphenoidal region and the cerebellum were affected. A double lesion of this kind is rare. In fact, amongst our records of twenty cases of temporo-sphenoidal abscess and twenty-five cases of cerebellar abscess suppuration in both regions has only been recorded in one other case.

The patient was a boy aged eight. Otorrhœa had been present on the right side for three weeks. For seven days there had been headache, drowsiness and frequent vomiting. No vertigo, nystagmus, or rigors had been observed.

When first seen he was very drowsy, but could easily be roused and answered questions intelligently. The pupils were equal and reacted readily, and no optic neuritis was present. No paralysis of the trunk, limb, or face muscles was present, and the knee-jerks were absent. The temperature was 98·4° F., pulse 90, respirations 16. The right auditory canal was filled with pus, and a perforation could be seen in the lower portion of the drum; no mastoid signs were present.

The radical mastoid operation was performed and extensive bone-disease discovered. The tegmen antri was diseased and the

exposed dura mater inflamed. The temporo-sphenoidal lobe was explored and a small abscess opened and drained. There was gradual improvement for about a fortnight, the boy's mental condition being considerably better, and vomiting ceased. A large amount of pus was discharged from the cerebral abscess. The improvement was not maintained, and twelve days after the operation double optic neuritis was observed for the first time, although the eyes had been examined every other day. Large quantities of pus continued to come away from the abscess, together with fragments of breaking-down brain substance. Three weeks after the operation vomiting returned, and further exploration of the temporo-sphenoidal lobe opened up another abscess. The patient, however, gradually got worse, and died five weeks after the first operation, no further localising signs or symptoms having developed.

At the *post-mortem* examination a large abscess cavity in the temporo-sphenoidal lobe and an unopened and unsuspected abscess in the right lobe of the cerebellum were found. The lateral sinus was healthy and the triangular area of bone showed no disease. There was opacity of the pia mater in the neighbourhood of the internal auditory meatus, and a further examination of the temporal bone showed that the path of the infection lay through the internal ear and internal auditory meatus.

The rate of mortality in cases of cerebral abscess is, I believe, considerably higher than a study of the text-books would indicate. The only reliable statistics are those to be obtained from the various hospital Reports.

I have not been able to make an exhaustive search, but during the five years up to 1904 in the "St. Thomas's Hospital Reports" there are recorded 19 cases of temporo-sphenoidal abscess, of which 12 died, and 7 cases of cerebellar abscess, of which 6 died, and 2 cases of combined temporo-sphenoidal and cerebellar abscess, both of which were fatal.

In the "St. Bartholomew's Hospital Reports" for the same period 17 cases are recorded, the proportion of cerebral and cerebellar abscess not being stated. Of these 15 were fatal.

Our own statistics at Leeds for the last six years record 10 cases of temporo-sphenoidal abscess, of which 5 died, 9 cases of cerebellar abscess, of which 6 died, and 2 cases of combined temporo-sphenoidal and cerebellar abscess, both of which were fatal.

Dr. Pritchard expressed his pleasure on hearing Mr. White-

head's concluding remarks. Probably all the members had been misled by the sanguine statistics of some surgeons on the matter, and had no doubt been disappointed by the small success obtained by operation. Probably at least two thirds of the cases died.

Dr. Grant said Mr. Whitehead had pointed out a very important thing with regard to the examination of that particular area, and in a case of his own, the notes of which he was about to read, the course would probably have been shorter if he had explored the cerebellum from that direction instead of entirely through the outer part. Mr. Whitehead spoke of exploring the cerebellum, but he did not say whether it was done through that part, or by an external trephine opening in the old situation. In Dr. Grant's case the spontaneous evacuation through the anterior opening was insufficient, and the discharge only began to decrease after the counter-opening was made on the external surface.

Mr. A. Cheatle pointed out that the triangular area described by Mr. Whitehead was really the posterior wall of the antrum, and the relation of that was very interesting. In some cases of a small antrum there was scarcely any posterior wall, and the partition was dense, while in others the posterior fossa was separated from the antrum by a very thin, translucent piece of bone. In some cases the triangular area was covered by cerebellum, in others by cerebellum and lateral sinus, and in others by the lateral sinus alone.

Mr. Whitehead, in reply, said that the point he wished to emphasize was the advisability of exploring the cerebellum through that particular area wherever possible, except in the few cases mentioned by Mr. Cheatle, where the lateral sinus was in such a position as to preclude such an operation. He wished to emphasize the importance of searching that region, because even in some recent text-books, including Mr. Lake's, the advice given was to explore the cerebellum through the old route, viz. behind the lateral sinus, a practice which he thought had quite gone out of fashion. His cases seemed to illustrate very well that the region he had alluded to was the one which should be always selected for the search; the abscess would be more easily reached and better drained through this triangular area than through an opening posterior to the lateral sinus. He agreed with Mr. Cheatle that it was practically the posterior wall of the antrum, although it would be better described as the postero-internal wall.

Case of Lateral Sinus Thrombosis treated by Operation without Ligature of Jugular Vein. Recovery.

By Dundas Grant.

Florence G—, aged fourteen, was first seen on December 1, 1904, complaining of headache, giddiness, and vomiting. She had been the subject of suppuration in the middle ear for two years and had been suffering from her symptoms for a fortnight, having had several shivering attacks. Her temperature on admission was 105° F.; it was decided to operate at once, and the radical mastoid operation was carried out, with the result that the cavities of the tympanum and antrum were found full of granulation-tissue but quite free from purulent discharge of any kind; this suggested that the absence of discharge might be looked upon as an indication that there was a purulent focus elsewhere; an opening was therefore chiselled into the bone behind at a slightly higher level than the antral opening; pus escaped under pressure, forcing its way up at the side of a mass of granulation-tissue. On enlarging the opening it was found that the pus was coming, not merely from the groove of the sinus, but from the interior of the venous channel itself, which was filled with granulation-tissue and broken-down clot. The broken-down portion was scraped away till blood flowed freely from the posterior part of the sinus, into which an iodoform gauze plug was then placed. At the lower part there was found apparently healthy organising clot, and this was left *in situ*; the wound was lightly plugged with gauze and an antiseptic dressing applied. Two days later all the plugs were removed; no hæmorrhage took place; the temperature became normal, and never rose above 99·4° F. No flaps were cut in the meatus, as it was hoped that what the operator had previously seen would take place, namely, that the membranous part of the meatus would gradually dilate and become fixed to the walls of the cavity by contracting fibrous tissue. This did not take place at the time, and, indeed, the passage was so narrow as to cause some disappointment. A little discharge also persisted from the deeper parts. For about two months the discharge was frequently sucked out by means of Siegel's speculum and spirit drops inserted at intervals of one or two days. Since then the meatus had gradually dilated, so that a sufficient opening was left, and it was believed that as this process of centrifugal contraction went on it would be quite as wide as could be desired. At the present moment there was no discharge.

A Case of Thrombo-Phlebitis of Jugular Bulb and Cerebellar Abscess. Ligature of Vein; Later Evacuation of Sinus and Bulb; Drainage of Cerebellar Abscess. Recovery.

By Dundas Grant.

D. B——, aged twenty-eight, printer, was referred to Dr. Grant on October 30, 1905, on account of dulness of hearing and discharge. Previously he had been giddy, with retching, but not real vomiting. On the day before he had an attack of cold and shivering, with actual vomiting. He had been the subject of chronic purulent discharge from the right ear of several years' duration. His left foot was weaker than the right, and the knee-jerk was increased. His pupils were normal, but he had slight nystagmus on looking to the left. The discharge was found to come from the attic, and there was no perforation sound on inflation. There was no doubt as to the necessity for at once performing the radical mastoid operation, and it seemed very probable that there was some more serious condition behind the disease in the middle ear.

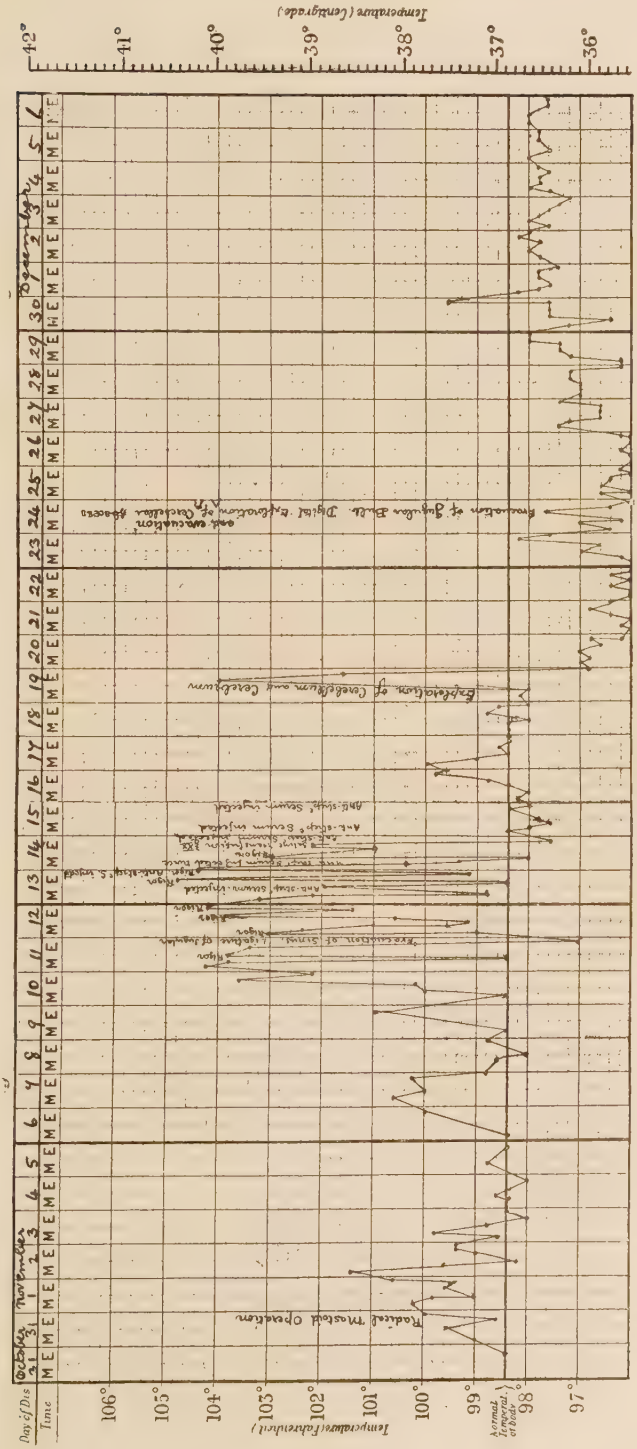
On the following day the radical mastoid operation was performed at the Central London Throat and Ear Hospital in the usual way; the antrum was found full of granulation tissue, the disease extending into the mastoid cells which were opened up.

The sickness continued for two days, and when the vomiting passed off ineffectual retching still remained. The patient complained of great pain over his head, and nystagmus was well marked when the eye was turned upwards, outwards, and to the left. The dressing was changed as required until:

November 10, when incontinence was noted and the temperature rose to 103·6° F. The blood count showed 4,800,000 red cells per c.cm., 19,500 leucocytes, 60 per cent. being multinuclear and 40 lymphocytes; there were no bacteria.

November 11.—In the morning the patient had a rigor lasting sixteen minutes. The temperature was 103·8° F., and in the afternoon he felt hot and had been sweating profusely for two hours.

The second operation was performed, the old wound being reopened, and an incision was carried backwards, at right angles to it, along the course of the right lateral sinus. The bone was carefully chiselled away over the course of this vessel, which, when exposed, presented a healthy appearance in its posterior part, but was abnormally white in the antero-inferior portions, the walls



Temperature Chart in Dr. Dundas Grant's Case of Jugular Bulb Pyæmia and Cerebellar Abscess.

Pulse and respirations were practically proportional to the temperature throughout.

being apparently thickened. No fluctuation impulse could be obtained with one finger on the course of the internal jugular vein in the neck and the other on the vertical portion of the sinus. This was taken as evidence that there was thrombosis between these two points. The sinus was now slit open and found to be partially thrombosed; blood flowed freely from it above, and this was stopped by plugging; a smaller stream oozed from below, and this also was temporarily plugged. Dr. Grant then exposed the internal jugular vein in the neck above the entrance of the common facial; it was so collapsed and small as almost to simulate the vagus nerve, and the common facial was distended as if it had already begun to take up the collateral circulation. Ligatures were applied at two places above the entrance of the common facial, the lower being the first tied; from the upper part, before ligature, blood was allowed to flow. A probe was passed up into the bulb of the jugular, and then a syringe was placed in the lumen of the vein to exercise suction, but no pus or clot was withdrawn. The wound in the neck was stitched with silk sutures, a small tube being left in for drainage. Going back to the retro-auricular operation wound, the plug from the lower thrombosed part of the sinus was removed and the freest possible flow allowed to continue for a short time for the purpose of washing out the channel. A plug was then re-inserted.

November 12.—In the morning the patient was subjectively much better, the temperature 99·6° F., and the pulse and respirations were in proportion. The head was clear and the tongue moist. At 9.30 in the evening the patient had a rigor, and Dr. Grant removed the plug from the post-aural cavity and wound in the lower part of the sinus. From the latter venous blood oozed to some extent, and the plug was, therefore, re-inserted; the drainage tube from the wound in the neck was withdrawn; slight facial paresis, involving chiefly the fibres going to the lips, was then noted.

November 13.—An injection of 7 c.cm. of anti-streptococcus serum was given; two hours later the patient was drowsy and the cerebration slow. The dressing was changed, and some sloughing was found to be taking place in the depth of the wound in the neck, which was syringed with biniodide of mercury lotion. The post-aural wound was opened freely, cleansed, and re-dressed. Temperature oscillated between 98·4° and 104·8°. The serum was repeatedly injected as marked on the chart.

November 14.—The patient's temperature remained unaltered

and his condition seemed hopeless. At 7.30 at night a subcutaneous transfusion of normal saline solution, to the extent of one pint, was carried out, the place selected being the tissues under the skin of the left thigh (the process lasting twenty minutes). At 10 p.m., two hours after the injection of the saline fluid, the temperature fell and remained nearly normal.

November 15.—The dressings were changed, and there was no rigor.

November 16.—The temperature rose to 99·8° F. in the evening, and when the dressing was changed much fœtid pus was observed in the wound behind the ear.

November 17.—Temperature normal, but still a large quantity of fœtid pus.

November 18.—The wound was dressed at two p.m., and two and a half hours later it was noted that the patient was becoming extremely drowsy, a slighter degree of this condition having been noted earlier in the day; the patient had also complained of headache; the drowsiness was more conspicuous in the evening, and was deepening into coma; it was only with difficulty that he could be got to give replies to questions; the pupils reacted still to light and were equal. Nystagmus was present as before, and it was now noted that the right hand was weaker than the left, a phenomenon which had been previously sought for and found wanting (the patient is a right-handed man).

November 19.—The same comatose condition being now more marked, lumbar puncture was performed, and the cerebellum and the temporo-sphenoidal lobe were explored. The lumbar puncture failed owing to the blunting of the point of the needle against the lamina of the vertebra, so that it did not enter the theca. The cerebellum was exposed behind the posterior border of the mastoid and below the inferior curved line of the occipital bone; it bulged distinctly, and an exploratory incision was made by means of a long narrow knife in the direction of the internal ear, also in other directions, and an exploring cannula was inserted, but no pus was found. The dura mater was stitched together, as also the skin and deeper structures. The temporo-sphenoidal lobe was next explored, and the meninges over it were found bulging, but an exploratory incision and the insertion of the cannula evacuated no pus. Hæmorrhage resulting from the division of the middle meningeal was checked by pressure. The dura mater and soft parts were sutured; the wound behind the auricle was again investigated and thoroughly cleansed. The temperature rose for

one reading to 104°, and then descended to 96·8°, remaining, as may be seen, much below the normal.

November 20.—In the depth of the wound there was a considerable amount of fœtid pus; the parts were cleansed with chlorinated soda, a plug moistened with this being left *in situ*.

November 21.—The fœtor was not so prominent, and the wound in the neck looked more healthy.

November 23.—The patient was still in a semi-comatose condition, dozing most of the day, and answering questions only very slowly, when roused. It was again found that the grip of the right hand was less strong than that of the left, and that sometimes the patient was seen to lift the right hand by means of the left one. There was some bogginess over the cerebellar incision, and on pressure fœtid pus flowed out. The cavity was cleansed, and the parts very lightly plugged, boracic fomentations being applied.

November 24.—The state of the patient remained very much the same, but it was noted that on pressure above pus flowed along the course of the right internal jugular vein; this pus (according to the notes) was thick and creamy, differing from that behind the auricle, which was fœtid, and that coming from the cerebellar incision, which was thin, brown, and fœtid. At six o'clock in the evening, the condition remaining as above, Dr. Grant inserted a probe into the sinus at the base of the wound in the neck, and found that it led upwards towards the angle between the mastoid process and the angle of the jaw; another probe was put in the course of the lateral sinus, behind the petrous portion of the mastoid, but the two probes did not touch.

In order to explore the bulb of the jugular vein, Dr. Grant carried the post-auricular incision downwards to meet the wound in the neck, and reflected the soft parts off the mastoid process, as also the periosteum, cutting through the posterior belly of the digastric after the superjacent muscular fibres; the mastoid process was chiselled away still further to expose the lateral sinus, and more especially the portion of bone dipping down between the sigmoid sinus and the bulb of the jugular vein, this part of the vessel being freely opened and cleansed. The source of the fœtid pus was, however, not so far discovered. The cerebellum was then once more exposed, but exploration with the knife and pus-seeker afforded as before no signs of an abscess. Dr. Grant then inserted his finger through the trephine opening and found that it entered a cavity of approximately about half an ounce in capacity, with smooth walls. Into this he introduced a narrow piece of indiarubber

tubing and two plugs of iodoform gauze, the extremities of these being brought out through the opening in the reflected section of the flap. The anterior part of the cerebellum to the central site of the remains of the sinus was soft and ragged, and it now seemed clear that the bulk of the pus had come from a cerebellar abscess discharging in this position.

November 25.—Plugs were removed from the cerebellum and found to be fœtid; the plugs from the neck and post-auricular incision were quite free from fœtor, the abscess in the cerebellum apparently relieving itself entirely through the posterior tube, which was withdrawn to the extent of about one inch.

November 26.—The wound in the neck was still inactive and covered with brownish pus. There was also some fœtid brownish pus again found in the antro-tympanic cavity, and welling from the cerebellum. The whole wound was carefully irrigated with boracic acid and swabbed with biniodide solution; a second very small tube was inserted into the cerebellum, and through it the abscess cavity was gently syringed with boric lotion, some pus being thus extruded; the second tube was left *in situ*; the wound was lightly packed, and boric fomentations were applied and changed every six hours.

The pus was examined on the 27th; in it diplococci predominated, which retained the Gram stain; there were a few intracellular micrococci and a few chain cocci.

November 27.—When the tube was taken out of the cerebellum the pus, which welled up, was fœtid and darker than on the previous day. The tube was re-inserted and the fomentations re-applied. In the afternoon Dr. Grant withdrew from the cerebellar cavity, by means of suction, some pus and disintegrated cerebellar substance. The tube was re-inserted and fomentations re-applied.

November 29.—The brownish pus which exuded when Dr. Buchan dressed the wound was in smaller quantity, and the pulsation was very marked. The tube was reduced in size, and the dressings and fomentations re-applied. The patient on this day said that he felt much better; his intellect was considerably brighter, and his replies to questions were more readily given; he sometimes spoke of his own accord, took more food, his pulse was more regular and of fair quality.

November 30.—The wound looked more healthy; the pus from the cerebellum, though still fœtid, was smaller in quantity; the patient was hungry and continued to have a good appetite.

December 2.—His general condition was better, his pulse

stronger and of better quality, his mental condition quite clear, the wound looking healthy, and the pus from the cerebellum less fœtid.

From this time the improvement was steady, and on December 6 the tube was permanently removed from the cerebellum. The wound began to close rapidly; healthy granulations were present, and it has steadily diminished ever since, the patient improving and being now free from all constitutional disturbance.

January 11, 1906.—A small flat sequestrum from the edge of the cerebellar opening was removed, and drying powder was dusted over the granulating surface.

January 18.—A granulation was removed from the depth of the tympanum and spirit drops were ordered to be inserted.

Among the features which seem interesting in the case are the following:

(1) The positive evidence of thrombosis in the jugular bulb.

(2) The negative results of exploration of the cerebellum through the post-mastoid trephine opening. Under similar circumstances an exploration through the anterior part, on the central site of the sigmoid sinus, would probably have been more positive in results.

(3) The effect of the subcutaneous injection of a large quantity of normal saline solution, which seemed to have been one of the turning-points in the case, the anti-streptococcus serum which was used, somewhat experimentally, being apparently devoid of result.

TWENTY-FIFTH ORDINARY MEETING.

Monday, March 5th, 1906.

THE PRESIDENT, MR. A. E. CUMBERBATCH, IN THE CHAIR.

The PRESIDENT announced that the Extra-Metropolitan Meeting would be held in Leeds on June 23, and asked for early intimation of intention to be present.

The following communications were made:

CASE OF ABNORMALLY LARGE EUSTACHIAN EMINENCES PROJECTING INTO THE NASO-PHARYNX TO THE EXTENT OF INTERFERING WITH FREE NASAL RESPIRATION.

BY E. FURNISS POTTER.

The patient came under observation owing to a "feeling of stuffiness" in the nose. On examining the naso-pharynx two large red swellings were seen projecting from the sides of the cavity, obstructing to a considerable extent the view of the choanæ. At the first glance they gave the impression of being enlarged posterior extremities of the inferior turbinals, but closer inspection showed that the latter could be partially seen beyond. The contour of the swellings, the orifices of the tubes, and the well-marked Rosenmüller's fossæ justified the presumption of regarding them as abnormally large cartilaginous extremities of the Eustachian tubes. On digital examination the impression given to the finger was that of cartilage covered by mucous membrane, and not that of infiltration. The exhibitor was of the opinion that the enlargement was not due to a pathogenic cause, although the patient was the subject of a double otorrhœa, and muco-pus could be seen adhering to the mucosa of the naso-pharynx. In his experience the case was unique; he thought it was simply an anatomical abnormality.

The case had been shown elsewhere, and the opinion had been expressed that the swelling was due to infiltration, the result of the

irritation of the purulent discharge. This view could hardly be tenable, as cases with otorrhœa and muco-pus in the naso-pharynx were met with every day, while the condition of this patient was one of extreme rarity.

Dr. Edward Law said he had certainly seen several similar cases, and he did not think the condition was caused by any discharge coming through the Eustachian tubes from the middle ears. When examined carefully a number of bands could be seen forming crypts in Rosenmüller's fossæ, in which secretion accumulated and became a source of irritation. He had seen cases where there was a prominent and enlarged posterior lip, and if one put the patient under an anæsthetic and scraped Rosenmüller's fossæ out with the finger or a suitable spoon a great deal of the swelling disappeared and certainly the colour became much less vivid. It was not merely a prominence of the posterior lip of the Eustachian tube, but the lip took quite an unusual course, and it looked in the present case as if it ran from the upper border of the Eustachian tube as far as the palate as a band about one inch and a half in length.

Dr. Jobson Horne said he saw the case last November, at a meeting of the Laryngological Society of London, and the impression he derived was that it was in a measure due to pathological causes. Dr. Law's remarks reminded him of a case he himself showed at the Laryngological Society some years ago, before there was an Otological Society, in which otalgia of uncertain origin was present; on examination of the posterior nares one saw an accumulation of mucus covering enlarged Eustachian cushions. Upon removing that he met with ulceration in the deeper recesses. After treatment the otalgia disappeared and the enlargement of the Eustachian cushions subsided.

Mr. Secker Walker asked whether the enlargement gave rise to symptoms, or whether the enlargement was discovered in the ordinary course of examination.

Mr. Macleod Yearsley said he did not think it likely that the enlargement would be caused by suppuration, but he remembered one case in which a patient with one suppurating ear had the Eustachian eminence somewhat larger than on the other side. That might have been only a coincidence.

Dr. Dundas Grant said he had seen several cases of enlargement of the Eustachian eminences, but none in which the colour was so high. He believed there was an inflammatory condition

as well, which was confirmed by the appearance of the vault of the naso-pharynx, in which there was a mass of adenoids bathed in muco-pus. He believed Dr. Law's view was correct, and that the swelling would partially subside.

Dr. Furniss Potter, in reply, said the only symptom complained of was a feeling of "stuffiness" in the nose. The hearing was much impaired from chronic suppurative middle-ear disease, affecting both ears. Against the view that the condition might be due to infiltration was the fact that on digital examination of the prominences the impression conveyed to the finger was that of cartilage covered by mucous membrane, there being no sensation of pulpiness. He did not quite follow Dr. Law's meaning, but certainly agreed that the shape was not that of the normal cartilaginous extremity of the Eustachian tube. The patient had been irrigating the naso-pharynx with alkaline lotion for the last four or five months, but the condition had not shown any alteration during this period. In reply to the President's suggestion, he said he would report the result of any operative treatment which might be undertaken.

Case of Otitic Extra-dural Abscess, associated with Paralysis of Sixth Cranial Nerve and Double Optic Neuritis.—With Remarks.

By J. Stoddart Barr.

This patient, a lad, aged seventeen years, first came under my observation on November 2 last, suffering from a purulent discharge from his right ear of sixteen months' duration.

The symptoms which excited alarm and led him to seek medical advice were: (1) headache, which began a fortnight previously, chiefly frontal, but extending also over the back of the head; it was more or less constant, and at times very severe; (2) a feeling of chilliness or slight shivering experienced several times about nine days before coming under observation (this never amounted to a distinct rigor); (3) sickness and vomiting, which recurred several times when he experienced the slight shiverings; (4) double vision and squinting of the right eye of five days' duration. There was no vertigo, with the exception of slight attacks following the syringing of the ear. There were no reliable data as to temperature or pulse before coming under notice.

When first seen, patient, although pale and ill-looking, was

bright and intelligent, and gave ready answers to questions. His temperature was 98·4° F. and his pulse 70. He frequently covered his right eye with his hand to prevent him seeing double. He complained of headache. There was, however, no excessive drowsiness. There were no paralytic phenomena unless in the eye. The knee-jerks were not well marked and ankle-clonus was absent. There was no disturbance of taste or smell. The tongue was clean but the bowels were constipated. The urine contained neither sugar nor albumen.

Ear condition.—There was considerable discharge of rather offensive matter from the right ear. After syringing the ear it was seen that there had been extensive destruction of the tympanic membrane, only the anterior fourth remaining. Small masses of cholesteatomata protruded from the atticus tympanicus. There was no tenderness on pressure or otherwise over the mastoid region or in the neck. The tick of a watch, normally heard at 40 inches, was heard only half an inch off. The left ear was normal.

Eye condition.—Dr. Rowan, ophthalmic surgeon, reported as follows: "The right eye won't pass the middle line outwards; there is paralysis of the right external rectus, causing diplopia, otherwise the eye movements are normal. The pupils respond sluggishly to light and accommodation. The left pupil is larger than the right, when at rest it is about two-thirds dilated. The pupils retain the relative difference in size even when acting. Ophthalmoscopic examination with undilated pupil showed, in right or affected side, marked optic neuritis, optic disc swollen, vessels enlarged, etc., but the edges of the optic disc can be faintly made out. The swelling amounts to about 1·5 mm. In left, the optic disc is more swollen than the right, the edges blurred and vessels full. The swelling amounts to about 2 mm. In neither were any hæmorrhages seen."

After consultation with my father it was decided to clear out the middle-ear cavities. On the day following, therefore, I performed the radical mastoid operation. The antrum was deeply situated, small in size and surrounded by dense hard bone, and filled with cholesteatomatous material, which also occupied the aditus and the attic. This was cleared away and the walls were thoroughly curetted, and although there was no special guiding track upwards, I thought it right to expose the dura mater over the roof of the middle ear, and it appeared healthy. Backwards, however, towards the sinus the bone was noticeably softer, and, on making a horizontal incision backwards, and removing the bone

by chiselling till the sigmoid groove was opened, a small collection of pus was found between the bone and the dura mater forming the sinus, at the median aspect of the latter. The sinus being further exposed to the extent of fully an inch, its wall was found to be covered with granulation-tissue, but as palpation did not indicate the presence of a thrombosis, and in the absence of signs of general septic infection, it was not opened. The cavities were douched with 1 in 20 solution of carbolic acid, iodoform powder was freely applied to their surfaces, and finally they were loosely packed with iodoform gauze. The horizontal part of the external wound was stitched, but the vertical portion was left open.

After the operation the temperature and pulse remained almost uniformly normal. The headache quickly disappeared, the pupils became equal, and the paralysis of the sixth nerve began to abate, although slowly, and it did not entirely pass off until after about three months. The optic neuritis, on the other hand, took a puzzling course; it actually increased in intensity, and on December 1, 1905, four weeks after operation, Dr. Rowan reported that the condition suggested an albuminuric retinitis, there being exudation and some small hæmorrhages present. Dr. John Love, consulting physician, saw the patient at this stage, and he was also impressed with the resemblance to the condition seen in chronic kidney disease. Repeated examination of the urine failed to show the slightest trace of albumen or sugar. Dr. Finlayson also kindly saw the patient and took a favourable view of the prospects, and neither Dr. Finlayson nor Dr. Love looked upon the paralysis of the sixth nerve as meaning a grave intra-cranial lesion.

The middle-ear cavities were treated by regular packing with strips of iodoform gauze, and now the external wound has healed with the exception of a small orifice, leaving a T-shaped linear scar. The interior of the ear is not yet completely dry; the patient's general health seems to be satisfactory.

Dr. Rowan examined the eyes on February 27, and reported as follows: "Eye movements normal, no strabismus or double vision. Pupils respond normally to light and accommodation.

"*Ophthalmoscopic examination.*—Pupils fully dilated with homatropine and cocaine.

"Right.—Optic disc swollen and pinkish, neuritis passing off. The vessels, arteries and veins, which are much smaller than normal, come forward and then curve back to the level of the fundus. No hæmorrhages seen, though carefully looked for. The macular region itself seems normal.

"Left.—Optic disc similar to the right, but paler in colour and not so much swollen. On the temporal side, about half a disc's breadth from the apparent margin of the optic disc, there are numerous white plaques parallel to the disc; vertically they extend about twice the disc's breadth, horizontally about half a disc's breadth. The individual white plaques appear about the size of an ordinary pin-head. On the nasal side of the disc there are similar white plaques, numerous but not larger than pin-points, and only visible when carefully focussed. No hæmorrhages seen, though carefully looked for. The macular region itself appears normal."

Remarks.—Three features of this case are specially worthy of attention—(1) the absence of definite symptoms pointing to the exact nature and situation of the lesion present; (2) the presence of an intense double optic neuritis only beginning to pass off four months after the radical mastoid operation and removal of the extra-dural abscess; (3) paralysis of the right sixth cranial nerve completely disappearing three months after operation.

(1) Such symptoms as have been described occurring in a patient suffering from chronic purulent middle-ear disease, namely, optic neuritis, paralysis of the right sixth cranial nerve, headache, chilliness, and vomiting, *associated with normal temperature and pulse,* seemed to be significant of some form of intra-cranial mischief. In considering the question of cerebral abscess, which the symptoms at first suggested, it was specially noted that there was no drowsiness nor slow cerebration, that, indeed, the patient was bright and intelligent, and that there was no involvement of the third nerve; while, in considering the question of lepto-meningitis or of septic sinus thrombosis, the absence of a high temperature, or of violent oscillations of temperature, seemed to exclude these grave conditions. The absence of pain over or behind the mastoid, and the normal temperature which existed, at all events while he was under our observation, seemed singular in a case of suppuration around the sigmoid sinus with involvement of its walls. In these diagnostic uncertainties it was evident that my first duty was to clear out the middle-ear cavities and be guided by the condition found. This operation, which included the exposure of the sigmoid sinus behind and the dura mater above, proved not only a diagnostic measure of great value, but a most successful therapeutic one.

(2) It is, of course, well known that optic neuritis is common in such intra-cranial lesions as brain abscess, lepto-meningitis, and thrombosis of the lateral sinus, but to find it on both sides and in so intense and persistent a form, associated with a moderately-sized

extra-dural collection of matter, is certainly much more rare. In looking over the literature of the subject, I notice that Barker, in his Hunterian lectures on intra-cranial inflammations starting in the temporal bone, describes a case very similar to this one, and other writers mention optic neuritis as a possible accompaniment of extra-dural abscess, without, however, mentioning individual cases or that they had found it in their own experience. It is to be remembered, on the other hand, and this is an important point, that a few cases have been recorded of optic neuritis occurring in persons with simple chronic middle-ear suppuration and presenting no other symptom of intra-cranial or vascular mischief. Both Politzer and Barker report slight forms of such. This is, I think, well worthy of further investigation, and, through the kindness of Dr. Rowan, the ophthalmic surgeon, we are at present engaged in the examination of the eyes of hospital patients suffering from middle-ear discharge, to determine whether any, and, if any, what proportion are the subjects of optic neuritis.

(3) In regard to the third interesting feature, there are very few records of paralysis of the sixth cranial nerve in connection with these intra-cranial complications of purulent ear disease. Knapp, of New York, describes in the *Archives of Otology*[1] a case very similar to this one, but different in so far that it was associated with a distinct diffuse lepto-meningitis and by the death of the patient. One would have expected that the sixth nerve would have been more frequently involved than the optic, when we consider the fact that, in its long course from the lower border of the pons to the optic foramen, it comes into much closer relation than the optic with the region of the sigmoid sinus and the cranial walls of the ear.

It is no doubt somewhat difficult to explain the exact pathological connection between such a comparatively small collection of pus in the neighbourhood of the sigmoid sinus and the nerve-lesions producing these ocular phenomena. The most ready explanation is that from the septic pachymeningitis around the sinus there extended, by microbic infection, more deeply a basal localised lepto-meningitis which, through the pia mater, involved the adjoining sheath of the sixth nerve or the more distant optic nerves. Such localised forms of lepto-meningitis must be very different from the fatal diffused forms with which we are too familiar in connection with purulent ear disease. Why the lepto-meningitis should remain localised and attended by no violent

[1] Vol. xxxi, No. 5, p. 374.

psychical or pyrexial symptoms as in this case, and in others become extensively diffused, with high fever and great sensorial disturbance, it is difficult to explain. I regret that no bacteriological examination was carried out, as this might have shed some light upon this point.

It might be that, on the other hand, the nerve-lesions were due to a thrombosis originating in the sigmoid sinus, the walls of which were undoubtedly involved, although there were no signs of systemic infection. Such an hypothesis would imply the extension of thrombi against the circulation to the cavernous sinus, and either by stasis of the circulation involve the optic disc, or, by pressure upon the sixth nerve cause the paralysis of the external rectus. I hope to receive further light on these interesting points from some of the members present.

Mr. Arthur Cheatle said paralysis of the sixth nerve was not uncommon; he had seen it in all sorts of circumstances. He believed it was due to a pachymeningitis in the posterior fossa. He had recently had under his care a case like Mr. Barr's, in which the pachymeningitis could be seen extending along the back of the temporal bone. The paralysis of the external rectus when it existed alone, he thought, did not show a gross intracranial lesion beyond localised pachymeningitis, and it was always recovered from. Optic neuritis, he believed, often lasted a long time, but it was not generally noticed, perhaps because the case was not looked at again after the operation.

Dr. Macnaughton-Jones remarked, in reference to the retinal appearances which had been observed in the case, though albumen was absent from the urine, that white patches and spots, similar to those seen in albuminuric retinitis, as in Bright's disease, and in the albuminuric appearances seen in pregnancy, were frequently observed in other conditions, but more particularly in leukæmia, and in leucocythæmic states. It was practically impossible to distinguish them from those of albuminuric retinitis. The practical bearing of this fact was the importance of estimating the number of leucocytes and the condition of the blood.

Dr. Pritchard expressed his agreement with Mr. Cheatle's remark. It was extraordinary that the paralysis of the sixth nerve should be practically always recovered from. In some of the acute cases it passed off rapidly. He remembered a case in which it appeared to pass off completely in six days. He could not understand it because the course of the sixth nerve was so short that

one could localise where the mischief had extended to very easily, and that was a very long way from the mischief in the antrum. It was important to remember that this was not such a serious symptom as one would expect.

The President expressed regret that Mr. Barr was unable to be present to respond to the discussion.

Notes of an Unusual and Fatal Case of Cerebral Abscess.

By Secker Walker.

The following are notes of a case which did not appear at first sight to present any great difficulty, or even to be of a serious nature, yet it subsequently became very grave and terminated fatally.

The patient, a woman aged thirty-four, came to the Leeds Infirmary in March last complaining of considerable pain in the right ear, with purulent discharge of three weeks' standing. The pain was localised by the patient in the meatus, which was extremely red, swollen, and tender; there was some localised mastoid swelling, apparently glandular, and this part was tender. On account of the external otitis it was not possible to see the drum membrane, but the discharge was free, and there did not appear to be retention of pus. The diagnosis I made was a subacute otitis media, the irritating discharge of which had produced an external otitis, with subsequent infection of the gland on the mastoid.

Under hot fomentations and local antiseptic treatment the swelling and pain disappeared in three days, and at her urgent request the patient went home. She returned a week later, on March 21, with a recurrence of the mastoid pain and tenderness, but no swelling. Temperature was 98·4° F. The symptoms again subsided, and by March 24 there was only very slight tenderness behind the ear, the meatus was much less swollen, and the aural discharge was subsiding.

The following night there was a very severe attack of pain, lasting several hours, and on the morning of the 26th there was considerable œdema and tenderness on the mastoid, extending forwards to the temporal region. During the five previous days the temperature had averaged 99° F., never having risen above 100° F., and the pulse varied from 72 to 84. There had been no shivering, vomiting, or headaches, in fact, no symptoms suggesting

any extension of the disease deeper than the middle ear. Temperature 98·4° F.; pulse 84.

In view of the recurrence of the œdema I operated at once. A small quantity of pus lay superficial to the bone behind the meatus, and was being forced out under some pressure through small openings in the bone in the squamo-mastoid suture. The gouge was entered here rather behind the usual position, and the first removal of bone exposed the lateral sinus, but did not open the vein.

In consequence of the slope of the bone there was very little room in front, so the further chiselling was carried upwards and forwards in the direction from which the pus came and entered a large subdural abscess over the roof of the antrum and middle ear, extending inwards some distance. On opening up the antrum and middle ear a sequestrum composed of the anterior part of the roof, with the malleus and incus, was found and removed. The bony cavities were well cleaned out, and the subdural abscess cavity gently syringed. The condition improved for a few days, then pain returned, temperature rose to 101·6° and pulse 84. The wound became slightly foul, but there was no discharge from the abscess cavity; the patient seemed incapable of the slightest reaction. Temperature fell to 97·8°, pulse to 60 and during the night fell to 44. Vomiting occurred once; there was no paresis. Early optic neuritis on the side of the disease was first seen now, although it had been looked for before. In the morning a further operation was performed. A portion of squamous and parietal bone over the region of the temporo-sphenoidal lobe was removed by enlargement in the upward direction of the previous opening. The dura was incised and a bent glass drainage-tube pushed in to the brain. Immediately a quantity of thin, foul-smelling pus was evacuated under great pressure. The finger passed into the abscess cavity could feel its limits. The walls were soft and presented no appearance of a capsule.

The pain in the head was relieved, but the temperature and the pulse remained low, drowsiness, developing into coma, came on, and the patient died on April 6.

At the *post-mortem* examination, conducted by Dr. Wardrop Griffith, there was a singular absence of cerebro-spinal fluid; no meningitis was found. There was a large abscess cavity, quite empty, in the right temporo-sphenoidal lobe, extending down to the descending cornu of the lateral ventricle; the choroid plexus was adherent to the outer wall of the cornu, and this had prevented invasion of the cavity of the ventricle, the walls of which

were green in colour. The brain-tissue for a great distance beyond the cavity was stained a canary yellow; in all other parts the brain was quite healthy. The lungs, the heart, and the kidneys were normal.

Condition of the temporal bone.—During the operation an opening was made through into the groove of the lateral sinus; it was not made intentionally, but served to show the condition of the vein. A large opening in the roof of the middle ear and antrum was present; this was partly made by the chisel and partly by the sequestrum. The case appeared to be one of an acute necrosis; for, in addition to the roof of the middle ear, a part, if not the whole, of the external semicircular canal was necrosed, though not yet loose. The head of malleus was carious and hollowed out into a mere shell; the incus was in a similar condition, but unfortunately was lost.

The chief difficulty in this case was the absence of any local or general signs of extension of the disease deeper than the middle ear. The symptoms pointed to an external otitis secondary to otitis media, and as far as I could read the case the primary condition of the middle-ear disease was proceeding quietly and satisfactorily.

It was the recurrence of the œdema that made me operate. The patient did not look or complain of being ill: the pain was of the character of external otitis, the swelling on the mastoid appeared to be, and, I believe, at first was due to an inflamed lymphatic gland.

At no time before the first operation were there any general symptoms of extension of the disease, such as a raised temperature, a quickened pulse, headache, shivering, or vomiting.

Mr. Cheatle asked whether it was an acute case. If it were acute necrosis and osteo-myelitis one would have expected severe constitutional symptoms all the time. It was possibly a chronic case, with pus tracking round the meatus, making the meatus look as if it were inflamed. Was Mr. Walker sure of the history?

Dr. Dundas Grant asked whether there was any explanation of the actual cause of death, as the operation appeared to have been proved by the *post-mortem* examination to have been eminently satisfactory.

Mr. Secker Walker, in reply, said he was unable to obtain any history of previous disease. She was married, aged thirty-four, and an intelligent woman. Although he thought there might have been chronic otorrhœa, the patient was sure that there

had not been. It was common to have a difficulty in hospital practice in getting a truthful history. A patient would say she was certain there was no discharge when one could actually see pus in the ear. He had hesitated to suggest the term "acute necrosis," but he thought it was a necrosis which had come on suddenly in a large part of the ear and in the semicircular canals. The pathologist reported that he did not see why the patient should have died. Death seemed to have been due to asthenia, and symptoms of compression appeared a few hours before death. *Post mortem* nothing was found to suggest compression. The brain was explored in all parts for further abscess, but nothing was found, and therefore he could not give any actual cause of death.

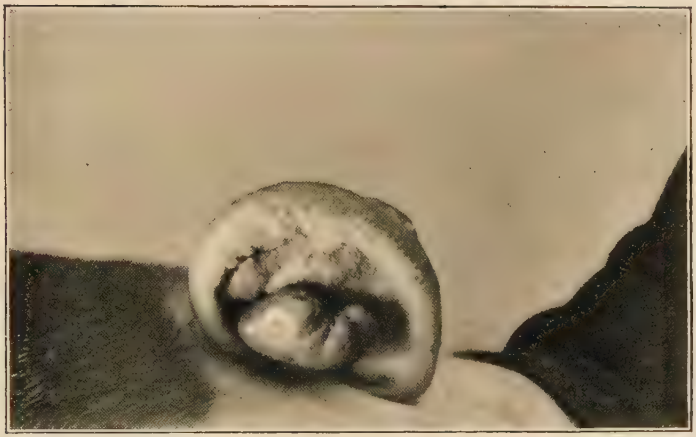
Angeioma of the Auricle (with Photographs, Macroscopic and Microscopic Specimens, and Plaster Casts from a Case).

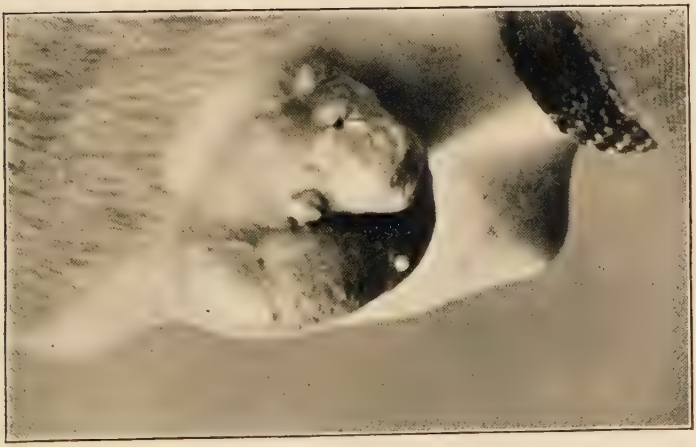
By Hugh E. Jones.

The patient was a boy, aged sixteen, with the following history. The left ear had always been larger than the right one and "birth-marked." Four years previous to coming under Mr. Hugh Jones's care there had been severe spontaneous hæmorrhage from the anterior surface for which a surgeon of Stafford had performed an operation, (the patient thought that some veins were tied). There had never been any pain, but the boy stated that there had been occasional discharge from the ear. During the last year or two the growth had been more rapid.

On admission to hospital the auricle was found to be enormously enlarged, measuring three inches from above downwards, two inches laterally, and two inches and a half from back to front. Several oval and round outgrowths projected from both surfaces. Large arteries and veins could be seen coursing under the skin. Hearing: Watch, R. 5 feet, L. 14 inches, Weber, positive to right; L. Rinne, positive. Bone conduction, full. Occasional tinnitus in left ear. The left meatus contained a quantity of epithelial scales, but no pus, and peroxide of hydrogen caused no effervescence. The membrana tympani was seen with difficulty and was opaque, but no details could be made out. Compression of the common carotid caused the growth to become distinctly paler.

The patient was shown at the meeting of the Otological Society held at Manchester in June, 1905. The following week Mr. Hugh E. Jones, after tying the external carotid artery, amputated the





To illustrate Mr. Hugh E. Jones's Case of Angeioma of the Auricle.

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auricle. The operation was uneventful; there was a fair amount of bleeding, which was easily controlled by pressure until the newly divided vessels were picked up and tied. It was considered doubtful whether the ligation of the carotid had been really necessary and how far it affected the bleeding. The soft parts were drawn together so that a raw surface not larger than a penny was left to cicatrise. No secondary hæmorrhage occurred. Up to February, 1906, there had been no recurrence of the growth in the skin.

Mr. Secker Walker said that some time ago he had a case of angeioma very similar to that shown by Mr. Jones. At Mr. Pridgin Teale's suggestion he tried at first transverse incisions round the growth, the idea being that they would result in sufficient cicatricial contraction to secure atrophy of the growth. Mr. Teale was present at the operation, but he (Mr. Walker) could not say that any atrophy resulted from what was done. Three or four weeks later he ligatured the external carotid, and immediately the growth became blanched and much smaller, and eventually shrivelled up. Recently he had seen the child again, and although the ear was fairly large and bluish and hung down more than the other, she was practically well. There had been no increased growth since the operation five years ago.

Dr. Jobson Horne said the Society had been very fortunate lately in having growths of the auricle brought under its notice. Recently a very interesting specimen had been referred to the Pathological Committee, and he suggested that perhaps it would be agreeable to Mr. Hugh Jones to allow the specimen from his case to be examined by that committee.

Dr. Urban Pritchard seconded the suggestion.

The specimen was referred to the Pathological Committee.

Some Complications of Suppurative Disease of the Middle Ear.

By Hugh E. Jones.

The following four cases having many points in common, it was found convenient to state briefly the facts of each case and then to comment upon the series.

(1) *Septic thrombosis of the bulb of the jugular vein following the use of chromic acid and the performance of the complete post-aural operation.*

The patient, a man aged twenty-one, had double suppurative

otitis media of sixteen years' duration, and was admitted into the Liverpool Eye and Ear Infirmary on August 10. Both tympanic cavities were filled with granulations, growing chiefly from the floor and inner walls. Hearing: Watch—R. on pressure, L. 3 inches. Bone conduction, full both sides. No vertigo. Chromic acid was applied to granulations in both ears, and treatment with peroxide of hydrogen was carried out. Boracic acid lotion and glycerine and carbolic acid drops were prescribed preparatory to complete post-aural operation. The temperature varied between 97·8° and 99·8° F.

On August 18 the complete post-aural operation was performed on the right ear, with thorough curettage of the tympanum. On the same evening the temperature rose to 100·8° F. The packing was removed on the third day (20th), but the temperature continued to rise, reaching 104·8° on August 23, when large oscillations and rigors began. No cord was felt in the neck.

August 27.—The lateral sinus was incised, the blood was fluid, the sinus was plugged, and the internal jugular vein was tied and divided. The symptoms of septic thrombosis continued unabated until September 7, when the healed wound in the neck was reopened, the upper section of the vein brought out of the wound and opened, allowing a large quantity of pus to escape. The sinus and vein were washed out daily. From this date the temperature kept low, and an uninterrupted recovery took place. Hearing of right ear was not improved.

January 23, 1905.—The complete post-aural operation was performed on the left ear. Uncomplicated recovery with good result and hearing of watch at 5 inches.

(2) *Acute temporo-sphenoidal abscess, previously unsuspected, discovered during mastoid operation.*

The patient, a boy aged seventeen, had double suppurative otitis media of many years' duration. The writer had decided to perform the radical operation upon the right ear, which appeared to him to be the worst in every way. The day before the date fixed for the operation the patient's doctor sent to say that the operation would have to be postponed because he (the patient) was suffering from an attack of influenza, and acute inflammation of the other ear. It appeared to the writer that these were reasons, not for delay, but for immediate operation on the left ear. After consultation with the doctor this course was taken. The only symptoms were severe pain in, and increased discharge from the left ear, and moderate

fever. When the later stages of the operation had been reached the patient suddenly stopped breathing; as there was nothing to suggest an overdose of chloroform it seemed possible that the trouble was caused by an intra-cranial abscess, and as the tegmen was carious the operator decided to search in that direction. While artificial respiration was being performed the tegmen was rapidly removed, the dura opened, and a small cortical abscess (about two drachms in capacity) was found immediately over the antrum. Natural respiration was restored, and the remainder of the operation and convalescence were uneventful.

The right ear was operated upon (with a good result) a fortnight later. Hearing, eighteen months later, R. 3 inches, left 5 inches—occasionally 12 inches.

(3) *Septic thrombosis of the lateral and sigmoid sinuses and the internal jugular vein down to the level of the omo-hyoid muscle, and complicated by an acute temporo-sphenoidal abscess.*

The patient, a boy aged fourteen, was admitted into the Liverpool Eye and Ear Infirmary on November 1, 1904, in a semi-comatose condition. The history was vague—recurrent suppurative otitis media for about three years, with a recent sharp attack of three weeks' duration, stupor and occasional delirium for one week. On admission there was a distinct cord felt in the neck and slight optic neuritis. The internal jugular vein was at once tied and divided at the level of the omo-hyoid muscle. It was thought that the ligature was below the extreme end of the clot, but immediately after tying the knot the patient stopped breathing, became cyanosed, and had a rigor. He soon recovered his natural colour, but it was thought advisable to leave the remainder of the operation until later in the day. In the afternoon the common facial vein and other large branches were tied off and divided, and the jugular brought out of the wound; the complete mastoid operation was performed, the lateral and sigmoid sinuses were exposed and opened up, and the clot was removed. Following this operation the oscillations of temperature gradually lessened, although the temperature was several times over 103° F.; the pulse rate never exceeded 90 per minute, and the patient's mental condition was not satisfactory; it was therefore decided to explore the temporo-sphenoidal lobe, and this was done on November 11. The dura over the antrum was partly necrosed, and a fair-sized abscess was readily opened in the brain substance above the necrosed area. Everything now seemed right until November 25, when rigors and

oscillations of temperature began again. This was due to suppuration in the upper part of the lateral sinus. In order to deal effectively with this extension it was found necessary to remove bone over the sinus right up to and partly over the torcular herophili. The sinus wall was pushed in at this point to control the bleeding, and the clot was removed after slitting up the sinus in its whole length. The clot was found to be breaking down to within half an inch of the torcular. There were three rigors during the following four days, and then true convalescence was established.

The boy was shown at the Manchester meeting of the Society in June, 1905. When seen a week ago all the cicatrices, including the antro-tympanic walls, were perfectly sound, and the boy's general health excellent. The watch was heard at two inches.

(4) *Specimen from a case of infection of the bulb associated with a small temporo-sphenoidal abscess which had not been diagnosed during life.*

The particulars of this case are given on p. 84 of the "Catalogue of the Museum of the International Otological Congress, London, 1899" (Specimens No. 640 and 640 A), Horne and Cheatle. The patient was a boy, aged eight. The illness had commenced twelve days before admission to the Liverpool Eye and Ear Infirmary, under one of the writer's colleagues, with right-sided clonic convulsions. On admission, the symptoms were those of sinus pyæmia and so continued to the end. The sigmoid sinus was explored, but contained fluid blood and its walls looked healthy. The boy died on the fourteenth day after admission. At the necropsy *post-mortem* clot was found in the sinuses and what was apparently an *ante-mortem* clot in the bulb, the rest of the internal jugular vein being empty. Carious patches were found in the floor of the tympanum, and also in the tegmen. On removing the brain a small temporo-sphenoidal abscess burst.

The points of interest illustrated by the above cases were as follows:

(1) The causation of bulbar thrombosis in Case 1 by either the use of chromic acid or by curettage of the fundus tympani. The granulations grew from the floor of the tympanum and were probably in direct communication by means of small veins with the bulb. If the chromic acid caused thrombosis of these venules and possibly of the bulb itself, the clot must have remained aseptic up to the time of the operation, nine days later. This is shown by

the temperature chart. In spite of the preliminary antiseptic cleansing and similar precautions during the actual operation the temperature began to rise on the night of the operation and continued to rise for three days until the oscillations characteristic of septic thrombosis began. Mr. Hugh Jones thought that clotting of the small veins a few days before operation would act to some extent as a safeguard against infection of the bone surface exposed by operation, but it was evident that, in this case, it had failed to do so; he did not, however, think that the action of the chromic acid was a contributory cause of the complication which ensued, and it was quite possible that it had prevented a general pyæmia. It was a question whether the sinus and jugular vein should not have been occluded, in the manner recommended by J. H. Nicoll, of Glasgow, when the temporal bone is extensively diseased, as a preliminary to the mastoid operation.

(2) Fluidity of the blood in the sinuses with absence of a cord in the neck might cause hesitancy in dealing radically with a case (as it did in Case 4), but when the classical symptoms of sinus infection were present the above negative signs should be taken as pointing to thrombosis confined to the bulb or to the still more dangerous condition of septic mural clotting.

(3) Primary or secondary extension of infection might occur in the direction of the torcular and might cross the line to the opposite lateral sinus. In Case 3 the progress of the disease was only arrested at the margin of the torcular. It was formerly taught that infection of the opposite sinuses was practically impossible owing to the partial partitioning of the two halves of the torcular. The writer of this paper has reported two cases in which the infective process had crossed the middle line and caused death (one with a large abscess in the opposite occipital and temporal lobes), and he thought that a mild phlebitis had extended to the opposite internal jugular in two cases which recovered.

(4) The danger of cutting off a small portion of the end of a tapering clot, when tying the vein in the neck, was to be avoided only by allowing a very liberal margin for the tapering of the clot.

(5) When the vein has been tied and divided three courses were open to the operator, and one of these must be followed: (*a*) the distal end of the vein might be brought out of the wound in the neck and left open; (*b*) the main branches might be tied off and divided and the whole vein in the neck excised; or (*c*) the sigmoid sinus, bulb, and jugular vein might be laid open in one long trench. The course of Case 1 before and after the end of the

vein was opened and the whole track washed out from above respectively showed in a very marked way the great advantage of this procedure. The writer thought that courses *b* and *c* need rarely be followed. He had not yet met a case in which he thought either plan would have been of greater value than the simplest one, *a*, however much more scientific they might appear to be.

(6) The writer agreed with those who held that cases occurred in which it was not necessary to tie the vein at all, but would limit the plan of simply cleaning out the sinuses to the cases in which, the infection having commenced high up in the sigmoid or in the lateral sinus, it could be demonstrated that the clot in the lower part of the sigmoid was sound. (A successful case of this kind was then under the writer's care, but was not included in this series.)

(7) Cases 2 and 4 showed how easy it was to overlook, not only latent abscesses of the brain, but also small acute ones. In Case 2 the symptoms were merged in the painful tympanic and mastoid suppuration, and in Case 4 were entirely overshadowed by the classical symptoms of septic thrombosis. In Case 3 the abscess was suspected from the day of admission owing to the relatively slow pulse rate, continued delirium, and stupor.

(8) It had often been pointed out that cerebellar abscess was frequently associated with thrombosis of the lateral or sigmoid sinuses, and there was some danger of its being thought that the association was almost invariable. In the catalogue of the museum already referred to he had found seven cases of cerebellar abscess with sinus thrombosis, but there were also seven temporo-sphenoidal abscesses with thrombosis of those sinuses or (in one case) of the superior petrosal sinus. It was not to be assumed, therefore, in the absence of definite localising symptoms, that the abscess was certainly in the cerebellum because the sinuses were thrombosed.

Dr. Dundas Grant said Mr. Hugh Jones's interesting collection of cases had given much to think about—more than there was time to deal with. With regard to thrombosis of the bulb of the jugular, he asked if members had employed a method which he (Dr. Grant) had found useful and which he described in connection with a case at the last meeting, namely, after the sinus was exposed to endeavour to get an impulse conveyed between a finger on the jugular vein and one on the exposed sinus. If such impulse could not be felt, the inference was almost indisputable that there must be blocking between the two, either in the bulb or higher up. In Mr. Jones's case no plug was found higher up, and he assumed it

was by a process of exclusion that he decided there was blockage in the bulb of the jugular. The method he described was one which, when negative, would not give much information, because there might be a parietal thrombosis. With regard to the washing out of the sigmoid sinus, from the vein or *vice versâ*, he had always felt a good deal of diffidence. There seemed to be a danger of sending septic material up some of the collateral tributaries of the veins. In washing from below there was a chance that one might rupture a vein and flood the meninges. Washing from above was not so dangerous, but there was still great possibility of driving material up into the inferior petrosal sinus. He had tried introducing a tube up the jugular vein and exercising suction by means of a syringe. He could not say that up to the present he had been able to withdraw much with it, but it might be found useful. When temporo-sphenoidal abscess arose from sinus-phlebitis he thought there had probably been persistence of a well-marked petro-squamous sinus. Mr. Cheatle's observations with regard to this made it more easily understood than otherwise. He thought everyone accepted Dr. Pritchard's view, that in many cases of cerebral and cerebellar abscess the extension of the disease into the temporo-sphenoidal lobe or the cerebellum had been through the small veins. This, he thought, explained the frequency of the association between lateral sinus thrombosis and cerebellar abscess. This extension through the small veins was, he thought, favoured by ligaturing the jugular vein, a proceeding to be avoided unless strongly indicated, as in the cases in which one made sure that the bulb was involved. He asked whether members had tested his method, or any equivalent one, for judging of the permeability of the bulb of the jugular, and if not, whether they saw any objections to the method.

Dr. Pritchard said it struck him at the last meeting that it would be very useful to test the condition of the jugular by means which Dr. Grant had mentioned. With regard to washing through, one would not tie the jugular at the bottom and force fluid down; if that were done, septic material might be driven into the small vessels. But he did not believe there was any practical risk of that kind when syringing was done gently from top to bottom with the jugular vein open.

The President said that a point of great interest in connection with the first case was the sepsis coming on after the application of chromic acid. He knew Macewen said that very often the granulations in the ear in connection with chronic suppuration

were a protection, and that removal of these granulations very often opened up a road to direct sepsis. Chromic acid, being an escharotic, should destroy any germs which were there at the time of the application, and it could only be by opening up channels for fresh germs to get in after sloughing had taken place that sepsis could occur. Sometimes in out-patient practice, in cases of chronic suppuration, with a small amount of granulation-tissue, limited in extent, a modified operation could be performed, when there were no beds available, consisting in removing the ossicles, scraping the bone freely, applying chromic acid, and then plugging, thus endeavouring to effect a cure. If Macewen were right, patients were exposed to considerable risk when granulation-tissue was thus destroyed by caustics. He did not know whether there was any direct connection in this patient between the application of chromic acid and the subsequent sepsis.

Mr. Hugh Jones, in reply to a question from the President, said he mentioned there was an interval of nine days, in which there was no rise of temperature, after the application of the chromic acid, and that the rise of temperature occurred on the evening of the day of operation. He thought it was the operation and not the chromic acid which caused it.

Mr. Herbert Tilley said he thought Mr. Jones's explanation was probably correct—namely, that during the operation he had opened small lymphatic spaces, through which septic absorption occurred. In other instances of suppurating bony cavities—for example, in the maxillary antrum or frontal sinus—it was uncommon to find a temperature during the chronic suppurating condition, provided the pus was not retained under tension. If a suppurating antrum were freely opened there was nearly always an evening rise of temperature to 100° F. or 101° F., the next evening 100° F., the following 99° F., and after this it fell to the normal. It was so invariably present that after the operation one was not alarmed to see the temperature go up in the evening. Last year he opened a chronic maxillary empyema in a medical man, in whom the temperature persisted for ten days after the operation. Before such operations there was an intact surface which was sufficient to prevent absorption of septic material, and as a result of the operation one opened up hundreds of small lymphatic and vascular spaces in which small septic thrombi would form. He had little doubt that that was what occurred in Mr. Jones's case. In the maxillary antrum one was working away from any region of vital importance, whereas in the ear the operator was in close contact

with more vulnerable regions, absorption was more likely, and there was less likelihood of free drainage taking place.

Mr. Hugh Jones, in reply, said Dr. Grant had asked him why he thought the temporo-sphenoidal lobe was affected in Case 2 when the breathing stopped during the operation, that symptom being generally due to cerebellar abscess. The only reason he could give was that there had been no symptoms of brain abscess, the temporo-sphenoidal lobe was very much easier to get at than was the cerebellum, and that there was some caries of the tegmen. Consequently he thought he would begin there, and if he found an abscess in the temporo-sphenoidal lobe he would be content, but if he did not find it he would then explore the cerebellum. He had not had the courage to put the palpation method of diagnosis of thrombosis of the bulb into practice, and he did not know whether Dr. Grant regarded it as altogether free from danger. He would have thought there was a risk of loosening the clots, especially mural clots, and that they might be carried into the circulation. The temperature-chart of Case 1 showed the great danger of tying the internal jugular without opening it. If it were tied at all, it should be left open from the beginning. He had had no experience of exposing the bulb, and thought it was an operation that was rarely called for. He agreed with Dr. Pritchard that there was very little danger in washing through from top to bottom. He had not seen it produce any ill effects. It was certain that the veins leading off from the sinus and bulb were already thrombosed, and if one left septic material in contact with the ends of these veins there was surely greater danger of septic extension along the clots if the septic material were left *in situ* than if it were washed away. In reply to the President, the chromic acid was applied in the first case with the idea of preventing the very danger which Dr. Herbert Tilley mentioned. He had employed the method in several cases before doing a complete post aural, applying the chromic acid freely to the granulations with the idea of producing clotting in the small vessels in the neighbourhood, diminishing the amount of hæmorrhage at the time of the operation, and enabling one to get a fresh surface, in the vessels of which clotting had already taken place, thus lessening the liability to septic absorption. The position of the carious patch in that case seemed to account for the whole accident. The thrombosis only occurred in the first ear operated upon. In doing the second ear no accident happened, although chromic acid had been applied to the granulations in that ear also.

TWENTY-SIXTH ORDINARY MEETING.

Monday, May 7th, 1906.

THE PRESIDENT, MR. A. E. CUMBERBATCH, IN THE CHAIR.

DISCUSSION ON "FIXATION OF THE STAPES."

INTRODUCTORY PAPER.

BY URBAN PRITCHARD.

MR. PRESIDENT AND GENTLEMEN,—There are two forms of fixation or ankylosis of the stapes: (1) fibrous, (2) osseous.

The first may again be subdivided into two:

(*a*) Where the fixation is due to fibrous bands stretched across the pit in which the stapes is situated, the bands binding the stapes more or less firmly in its position. These fibrous structures are the result of former non-suppurative otitis media, and have been demonstrated very beautifully by Politzer and other observers.

(*b*) Where the fixation is due to a solid mass or cushion of new tissue, the result of further organization of granulation-tissue which has been left from previous suppurative otitis media.

(2) Osseous fixation may also be subdivided into two forms:

(*a*) Ossification of the annular ligament of the stapes, which is apt to occur in the course of otosclerosis, from extension of the osseous change in the bony capsule surrounding the internal ear.

(*b*) A rare form of fixation due to ossification of a solid mass of new tissue, being, in fact, merely a further development of the second form of fibrous fixation, and therefore also primarily caused by former suppurative disease.

Diagnosis.—(1 *a*) There is sometimes considerable difficulty in recognising this form of fixation by fibrous bands, and especially in diagnosing between fixation of the stapes and that of the other ossicles. There is marked deafness, considerable immobility of the ossicles, usually retraction, and some thickening of the membrana

tympani. Inflation is followed either by no improvement to the hearing or only temporary improvement. There is increased bone-conduction, marked paracusis, high notes are heard better than low ones, and there are the other signs of chronic middle-ear catarrh.

(1 *b*) When the fixation is due to a solid mass or cushion of new tissue there is nearly always considerable loss of the membrana tympani and signs of former severe suppurative otitis media. Sometimes the remnants of the membrane are glued by the new tissue to the inner wall of the tympanic cavity. The tests point to middle-ear defect as in the first form of fibrous fixation.

(2 *a*) In these cases there are all signs and history of advanced otosclerosis. The membrana tympani is practically normal, unless there are catarrhal complications. There is marked deafness, and lessened mobility of the ossicles. Through the advanced condition of the otosclerosis the tuning-fork tests usually show reduced or normal conduction—*e. g.* internal as well as middle-ear defect. Paracusis is usually present, though not when the internal ear is very much affected. Tinnitus is often a very distressing symptom. Hyperæsthesia of the auditory nerve is frequently very marked, especially in very advanced cases where the internal ear is much involved.

But in spite of all these signs and symptoms it may be very difficult to make an absolute diagnosis of the ankylosis itself. Personally I am very sceptical of the value of the various tests that have been brought forward from time to time by various authorities, and I am very anxious to learn the opinion of the members of the Society on the value of the Gellé tests.

(2 *b*) Fixation by ossification of new tissue is very rare, but its diagnosis presents little difficulty, for besides the signs of former severe suppurative damage, the probe will readily reveal the bony nature of the mass.

Prognosis and treatment.—It must at once be admitted that fixation of the stapes in any form is fatal to the return of good hearing.

In the osseous forms there is no known treatment of any avail, and practically we may say the same of fixation by a mass or cushion of fibrous tissue, although Politzer, I know, has thought that there may be a future for operative treatment in some of these cases.

The prognosis and treatment in fixation from fibrous bands, though not very encouraging, are not quite so hopeless.

We have all come across cases in which considerable improvement to the hearing has resulted from a fresh attack of acute otitis, which has broken down old adhesions and thus left the parts less fixed. However, we should hardly feel justified in inducing such

an inflammation with its septic risks on the off-chance of thus improving the hearing power.

But in a way this may be imitated; the internal administration of iodides so as to produce slight coryza and with it some softening of the parts within the tympanic cavity, followed by somewhat forcible inflation, has been employed with occasional good results.

The introduction into the tympanic cavity of pepsin or still better of papain might more thoroughly soften the adhesions and allow forcible inflation to break them down.

Direct mobilisation of the stapes by opening the membrane and then loosening the stapes has been tried, but without any success.

Direct mobilisation by means of some modification of Lucae's instrument may prove of some service in the future, and on this point I am hoping for some valuable hints from our very ingenious friend Mr. Lake. For some time past we have all been trying indirect mobilisation by means of rapid pneumatic massage; at present our success has not been great, but really this mode of treatment is still on its trial.

Lastly, gentlemen, if you will allow me to wander into the realms of imagination and to build a little castle in the air, I should like to mention a vague idea that has struck me as to the possibility of making a new fenestra when the fenestra ovalis is rendered useless. Could we open the membrana tympani, drill a hole into the labyrinth, and graft, as it were, a flap of the membrana over the hole, so as to form a membrane for the new artificial fenestra?

If this could be done, might we not restore a considerable amount of hearing? At any rate the results of the recent operative work on the internal ear by Mr. Ballançe, Mr. Lake, and others lead me to think it very possible. And if this were so, should we not have solved one of the greatest problems in the whole field of otology?

Introductory Paper.

By Thomas Barr.

Gentlemen,—In selecting fixation of the stapes as the topic for discussion to-day, the Council has invited us to turn to one of the darker spots of otology. Less than two years ago, when introducing, along with Dr. Pritchard, a discussion at the Oxford meeting of the British Medical Association on the treatment of the

dry non-suppurative forms of middle-ear deafness, which included fixation of the stapes, I reviewed at some length the multiform, though, I am afraid, mostly insufficient, methods of treatment. I shall not, therefore, to-day take up that aspect of the subject which has already been touched on by Dr. Pritchard. In regard to a condition which we have regretfully to admit yields but little to treatment, either surgical or medical, it is an important point gained if we can isolate the affection and differentiate it from other conditions.

I therefore propose taking up briefly the "differential diagnosis of fixation of the stapes."

Human hearing may be said to depend pre-eminently upon the integrity of the tympano-vestibular connection. Obstruction to the propagation of sound at this point of the hearing pathway is, of course, fatal to functional efficiency. Stiffening processes effectually check those indescribably fine oscillations of the foot-piece of the stapes, and shut out the patient from the world of sound.

It may be convenient to consider fixation of the stapes (1) as the main feature of so-called otosclerosis, in which bony fixation of the foot-piece is often associated with osseous changes in the labyrinthine capsule; (2) as found in non-suppurative catarrh of the middle ear, when the stapes may be fixed by inspissated secretion or organised catarrhal products in the pelvis ovalis, by induration of, or calcareous deposit in, the annular ligament, or by prolonged tension, or perhaps fixation of the whole chain of bones due to an indrawn membrane; (3) as a result of acute and chronic purulent processes, in the latter of which the stapes may be seen through a perforation, firmly imbedded in inspissated secretion or new connective-tissue formation. The first variety is probably the one chiefly intended to fall within the scope of this discussion.

At the outset we may remark that our knowledge of stapes ankylosis suffers from the fact that but few opportunities for *post-mortem* examination present themselves, as, of course, the condition does not lead to a fatal issue, and, therefore, our means of procuring anatomico-pathological confirmation of conclusions, drawn from clinical observations, are limited. Still, much valuable information has been gained by *post-mortem* observation following clinical experiments. Dr. Alfred Denker, of Erlangen, has gathered together records of twenty-seven cases in his "Die Otosklerose," in each of which anatomico-pathological examination supplemented careful clinical observations during life; this work of Denker

constitutes, it must be admitted, a most valuable contribution to our scientific knowledge of the subject. I may remark, in passing, that this valuable method of investigation seems to have been hitherto very much monopolised by continental workers, such as Bezold, Lucae, Hartmann, Politzer, Siebenmann, etc., and it is, unfortunately, noteworthy that in Dr. Denker's work British contributions are conspicuous by their absence.

Denker's cases yield important information, based upon *post-mortem* changes, both macroscopic and microscopic, in regard to the value and significance of the tests of Rinne, Weber, Schwabach, and Gellé, as well as the significance of abnormal perception of high and low tones.

With the methods of examination now at our disposal, it may be said that we are able, with an approach to certainty, to differentiate simple, uncomplicated fixation of the stapes during life from other conditions. We find a person suffering from deafness, more to speech than the watch, beginning imperceptibly and advancing gradually, without marked fluctuations and without any history of catarrhal or inflammatory attacks; we observe a normal condition of the tympanic membrane, with or without a pink coloured reflection; we find a permeable state of the Eustachian tube shown during Politzerisation or catheterisation, not only by the character of the auscultatory sounds, but (and I regard this as more important) by the distinct movement of the membrane outwards, observed by inspection; and, lastly, we find no improvement in hearing resulting from such an effective inflation.

So far the condition might be one of labyrinthine or nerve-mischief, and until recently there is no doubt that fixation of the stapes has been often diagnosed as nerve-deafness. If, however, we now find that bone-conduction is well maintained, that it is indubitably in excess of air-conduction as shown by each of the tests of Weber, Rinne, and Schwabach (the so-called Bezold's trio of symptoms), the diagnosis admits of little doubt. Further, if we are able to demonstrate that there is a raising of the lower tone limit, that is, impairment of the hearing of low notes, while the upper tone limit is normal, as defined by a series of tuning-forks and Galton's whistle, assurance would be rendered doubly sure, and the conclusion would be almost as certain as anything in medical diagnosis that the impediment to hearing is of the nature of fixation of the stapes, and definite labyrinthine disease would be excluded.

The diagnostic value of Bezold's trio of symptoms (namely,

the tests of Rinne, Weber, and Schwabach) rests upon the best of all foundations, namely, clinical observation during life, along with microscopic and macroscopic examination after death. We are, therefore, justified in concluding that when this trio of symptoms exists, with an unchanged tympanic membrane, a patent Eustachian tube, and a negative result from inflation, the case is one of simple fixation of the stapes. The value of the tuning-fork tests in determining the state of the tone perception has an equally scientific basis, since Lucae, Schwabach, and Bezold have established by experiment that in fixation of the stapes the lower tone limit is raised, and that in pure cases of fixation a marked lowering of the upper tone limit has never been observed.

But cases are not always simple and uncomplicated. The tests, especially as applied to bone- and air-conduction, do not then agree—in fact, the one test may seem to contradict the other. We may find that where Rinne is positive, Weber's test may be accentuated in the affected ear. Rinne may yield a positive response to a higher pitched tuning-fork (say 256 vibrations) while negative to a lower pitched (say 128 vibrations). It is a familiar experience that low notes are more likely to yield a negative result by Rinne's test than higher ones. The value of Rinne's test is also limited by the well-known fact that in elderly persons it usually gives a positive result. When the results of these tests are not in harmony, neither pointing to simple fixation nor to labyrinthine disease, we are then very much aided by testing the hearing duration with a series of tuning-forks embracing a considerable extent of the tone scale. For this method we are very much indebted to A. Hartmann, whose experiments with tuning-forks extended to nine octaves, and were of the most painstaking character. He found that in fixation the hearing power by air-conduction gradually increased, both in intensity and duration, as he ascended the tone scale from below upward. In nerve-deafness, on the other hand, the hearing duration gradually decreased as he passed from the lower to the higher tones. Hence if, with a series of tuning-forks, we find a raising of the lower tone limit, with no change in the higher tone limit, we have probably fixation of the stapes, while with impaired hearing of the lower tones and at the same time impaired hearing of the higher tones we are likely to have fixation of the stapes plus labyrinthine disturbance. The impaired hearing of the lower tones will point to fixation of the stapes, while the impaired hearing of the higher tones will indicate labyrinthine mischief.

These conclusions I regard as of great value, and although in my practice I generally limit myself to a series of five octaves, extending from C 128 vibrations to C^4 2048 vibrations, using Galton's whistle for still higher tones, I have learned to put great stress upon such tests, especially when a mixed condition exists.

As an aid to the differential diagnosis we have, in my opinion, a test of some value, although not always reliable, in Gellé's experiment. If the sounding tuning-fork by air-conduction, or placed on the vertex of the head, remains unaltered in loudness when the column of air in the meatus is compressed (negative result) the diagnosis of a fixed stapes may be regarded as strengthened. When the sound is, on the other hand, diminished during the compression there is probably a movable stapes. Of course, if we have an intelligent patient the result is more reliable. The same may be said regarding all the other tests. A musical patient is also a great desideratum in all these tests. The test seems to be of most value when the deafness is very marked. One sometimes observes giddiness during the compression of the air in the meatus; this I look upon as indicating labyrinthine mischief.

In forming a differential diagnosis we would properly and naturally consider all these tests, not only in relation to one another, but also in connection with other symptoms, subjective and objective, and such factors as the history and the etiology. The exhibition of the phenomenon of paracusis Willisii would, for example, furnish confirmatory evidence of fixation. Weight would also be attached to the gradual occurrence of the deafness, as compared with a sudden onset, the latter pointing more to labyrinthine disease. The presence of an hereditary element usually favours the idea of fixation, while such causes as syphilis, influenza, exposure to loud sounds, nerve-shock, would point more to labyrinthine mischief. Giddiness and noises in the ear no doubt occur in both, but they are more frequently met with and are more pronounced in labyrinthine affections.

The forms which result from and are mixed up with catarrhal and inflammatory products and processes in the middle ear generally manifest themselves by objective changes in the tympanic membrane or tympanic contents, such as cicatrices, atrophy, opacity, calcareous deposit, permanent retraction of the tympanic membrane. Probably the fixation in many of these cases is not so inveterate as in the oto-sclerotic form, and is more due to the binding of the crura to the walls of the pelvis ovalis or to prolonged retraction of the tympanic membrane, with more or less

fixation of the malleus and incus, rather than to osseous changes in the annular ligament.

Can we distinguish fixation due to binding of the crura or connected with general ossicular tension from that due to rigidity of the annular ligament? This distinction is somewhat important in regard to treatment, as the former are more likely to be benefited by surgical treatment than the latter.

In these mixed conditions I think it is possible to gain some information from exposing the stapes, when the incudo-stapedial articulation is situated lower down than the periphery, by forming a window opening through the tympanic membrane, and observing through it the condition of the crura, and even determining by pressure, say with the feather probe of Lucae, the mobility of the stapes. Such a window is easily and painlessly made, as I can testify, after local anæsthesia has been produced by Neumann's method, which was described and demonstrated by Mr. Seymour Jones and my son at a meeting in Manchester. When the region of the stapes is already exposed by a perforation, and the condition of the crura partially rendered visible to the eye, as well as evident to the touch, the state of matters, of course, admits of no doubt.

In conclusion, I would say that there is need here for more anatomico-pathological investigation in connection with careful clinical observation, and I fear that we in this country are not doing our fair share of such work. We want, for example, to know more as to the state of the membrane closing the fenestra rotunda, which must play a part in the phenomena of fixation of the stapes. In this direction, gentlemen, lies the possibility of further advance in the knowledge and treatment of this serious, and hitherto almost intractable, impediment to hearing.

Introductory Paper.

By Richard Lake.

I much appreciate the honour done me by placing me amongst the openers of this discussion. The subject is one of very great interest, and, as is probably already well known to you, there appears to be no doubt that the first to describe the pathological condition in question was our most celebrated aurist, Toynbee. The time at my disposal, however, does not permit of an historical introduction, nor would I weary you with uninteresting details.

The method of procedure which seems to me to be the simplest is to glance at the causes which may lead to immobility of the

stapes, and to class them broadly under two wide headings, as one has been in the habit of teaching in one's clinic, these two headings being "intrinsic" and "extrinsic." As an ankylosis of a joint may be intrinsic or extrinsic, bony ankylosis or fibrous ankylosis intra- or extra-capsular, so also may we in this instance divide our causes of fixation into spurious or fibrous, and true or osseous, and with few exceptions all cases which come under our notice can be so subdivided.

Before, however, proceeding any farther in this matter, I think it will be well for me to refer to the necessity of our introducing into our nomenclature a title which exists in foreign literature—that is, to describe the depression in which the stapes lies as the vestibule, retaining the word "oval window," or "fenestra ovalis," for that portion occupied by the foot-plate and the annular ligament.

Taking first the extrinsic causes, or, as we may say, those conditions which are perhaps of least pathological importance. Of these the following occur most frequently:

First, stapedial immobility may be due to fixation of the malleus combined with an indrawing of the latter bone. This condition of the malleus, however, is by no means always accompanied by interference with the free mobility of the stapes. In fact, one must presuppose a particular sequence of events or coincidences of inflammatory trouble in which the condition which causes the indrawing of the malleus is accompanied by some process which interferes with the mobility of the stapes, more especially in the vestibule. This may be due to inflammatory thickening of pre-existing trabeculæ or bands or to the formation of adventitious bands by an inflammatory process. More rarely a bony process is found connecting the stapes by one of its crura with the side of the vestibule, which must have had its origin in a more acute inflammation, chiefly perhaps localised in the vestibule. Then one notes those conditions which may be accompanied by fixation of the malleus, but which also may be unaccompanied by it. The first of these is that calcareous degeneration which may occur in the annular ligament. The next is rigidity of the stapes, due to a sclerosis of the mucous membrane of the tympanum, either (*a*) as a part of a general sclerosis of the air-passages (accompanied, in the nose especially, by dry and frequently by atrophic rhinitis); (*b*) as a result of frequent catarrhal inflammations; (*c*) as a result of inflammatory changes in the vestibule, unaccompanied by fixation of the malleus.

True osseous fixation is relatively rare, and it probably only occurs under two conditions, namely, (1) rarefying osteitis of the labyrinthine capsule, and (2) as the result of chronic suppuration in the middle ear. (With this we have in this discussion but little to do.)

With the former, however, we have much to do, but as the pathology of this disease will be considered especially by my colleague, Dr. Gray, I shall content myself with saying that what happens in this instance is that the bony foot-plate of the stapes becomes united to the labyrinthine capsule, the annular ligament being absorbed and replaced almost entirely by bone.

If fixation of the stapes occurs as a direct result of fixation of the malleus, but with little or no concomitant intra-vestibular thickening, then a condition presents itself which is well exemplified by the following cases:

Case 1.	Case 2.
Acoumeter, 2′.	Weber, pos.
Voice, over 15′.	Acoumeter, 6′.
Whisper, 3′.	Whisper, 18″.
Rinne C., pos.	Rinne C. } neg.
Rinne C.[2]	Rinne C.[2] } neg.
C. mastoid – 12″.	C. mastoid – 3″.
	Air conduction, 1C 64 to C^5.

In Case 1 my opinion is that the fixation of the malleus was alone directly responsible for the affection—that is to say, the deafness—and that it was secondarily influenced by a pathological condition of the stapedius muscle, probably a tonic contraction, which was relieved by the administration of strychnine, together with the oto-massage;[1] whereas, on the contrary, in Case 2 the condition was complicated either by a fixation of the stapes, due to bands of slight thickening of the mucous membrane, or interference with the capsule of the inco-stapedial joint, and it was only after forced movement of the larger bone that improvement was obtained. This I believe to be an important point.

In cases where a sclerotic process has occurred one finds pronounced the following points on examination when stapedial immobility is present: Paracusis Willisii (not constant); Gellé, negative; Rinne, doubly negative; C. on the mastoid, or bone

[1] Here I would point out the temporary or extrinsic cause is shown by the positive Rinne.

conduction, usually —, rarely normal; Galton's whistle, usually a slight loss in upper-tone limit.

When the hearing power is tested by a series of tuning-forks it shows a slight loss of the low notes and a diminished appreciation of the high tones.

In these cases I have personally found that the greatest benefit is derived from treatment directed to the ear itself, exclusive of internal medication, such as injecting through the Eustachian tube a few minims of the following: Red iodide of mercury gr. iv, lanoline ʒi¾, paroleine to ℥i. When the mixture is made a little heat may be employed. After the injection the patient should be treated by oto-massage. Strangely enough, those cases in which paracusis Willisii is present have appeared to me to give the better results.

We come now to that most serious condition fixation of the stapes due to otosclerosis, or, to be correct, rarefying osteitis of the labyrinthine capsule. We must preface our remarks on this condition by the statement that fixation of the stapes is not an invariable feature in this complaint. That it is a usual one is equally true. Our principal characteristic signs in this disease are a double negative Rinne, paracusis Willisii, and loss of the lower tones, with usually a prolonged bone-conduction when the nerve is intact or hyperæsthetic, and with a loss of bone-conduction when there is accompanying internal ear disease. Gellé's test will be negative when the stapes is fixed. Briefly to review a few tests:

With fixation of the stapes due to mallear immobility alone the loss of bone-conduction will be very slight, I think one might say never exceeding seven seconds, and this will be associated with no loss of the upper notes in the Galton whistle.

When the post-catarrhal sclerotic process has developed bone-conduction will be reduced, but if unaccompanied by nerve disease the reduction will probably not exceed twelve seconds.

I must admit that these figures are open to objection, but they are the result of a careful consideration of my cases in which I believe these conditions to have been present.

We see that with paracusis Willisii and a double negative Rinne, with a loss of the low tones, Gellé's test must be negative, that with regard to bone-conduction, this may be prolonged or diminished according to the state of the nerve.

That, for purposes of diagnosis, the presence of fixation of the stapes may be accurately determined by an incision exposing the

part is no doubt a truism, but, with one exception only, I have never made this experimental incision, safe though it is.

The stapes was absolutely immovably fixed, and the operation was done at the express desire of the patient, who was a Roman Catholic priest, in order that it might be of some assistance to others. He had already been subjected to every form of treatment known to me, including the injection of the liquid ointment I have referred to. In another instance I operated on, a case for vertigo, the stapes was fixed also by bone. In neither case was the mucosa red!

In conclusion, as to prognosis: In fixation, through immobility of the malleus: good. Through the formation of cicatricial tissue: fair. By bone ankylosis: bad.

Introductory Paper.

By Albert A. Gray.

While recent years have seen but little advance in the treatment of the condition of fixation of the stapes, and while even the etiology of the affection is still obscure, the pathologist fortunately has a different story to unfold. Our knowledge of the pathological anatomy of fixation of the stapes is, of course, by no means complete, but the same may be said of many other affections; and when the difficulties of the cases are considered there is nothing to be ashamed of in this respect. Sooner or later it is to be hoped the increase of the knowledge of the pathology of the conditions under discussion will bring about a revolution in the treatment of this disease.

It is impossible owing to the limits of time to go into the history of the pathology of fixation of the stapes in the oval window. It should, however, be pointed out that the discovery of the condition is by no means recent. It was known to Morgagni (1), to Valsalva (2), and to Meckel (3), and was by them associated with deafness. Toynbee's (4) investigations were the next great step in the elucidation of the question; and though they lose a great deal of value from the fact that, in the great majority of cases, there was no clinical history associated with the preparations themselves, the central fact remains that Toynbee first showed the great importance of the subject. Voltolini's (5) remark upon the comparative worthlessness of Toynbee's work is therefore not only ungracious in the highest degree, but is directly untrue. The fault did not lie with Toynbee but with the other aurists of the day who failed to

carry on the work to its natural conclusion—the relationship of the anatomical conditions to the clinical picture of the disease. Since that time pathological knowledge has increased, at first slowly, but latterly with greater rapidity, until now the anatomical changes which are to be associated with the fixation of the stapes in the oval window are fairly well known. On the other hand, it must be admitted that the pathogenesis of the disease is still very obscure.

The term "fixation of the stapes" does not describe, properly speaking, a pathological entity. It is really a result of other pathological changes which are widely different from one another. Thus, it may be the result of accident, as in a case recorded by Politzer. Again, there can be little doubt that the fixation of the bone which sometimes occurs as a result of suppurative changes in the middle ear, is frequently due to direct affection of the joint by the suppurative process. The pathological aspect of such cases is too obvious to require more words, and in the following pages it will be understood that reference is made only to the pathology of fixation of the stapes as we find it in cases of so-called osteo-porosis of the temporal bone.

Fixation of the stapes is a result of changes in the bony capsule of the labyrinth. So far as is known it does not occur as a result of direct inflammatory changes in the tympanum apart from the exceptions stated above. Habermann, however, holds that the origin of the disease is to be found in the tympanum, and that the process passes from that cavity into the bone and thence into the stapedio-vestibular articulation. Other observers hold that the change takes place primarily in the bone, while a few maintain that in some cases the origin of the disease is to be found in the tympanum and in others in the bone itself. Before discussing these different views in detail it is necessary to describe the actual anatomical changes which have been found.

As viewed by the naked eye it has been found that the stapes may be fixed to the oval window by bone either along the margin of the foot-plate or by means of bony trabeculæ running from the limbs of the ossicle to the adjacent portions of the oval window. In some cases both of these methods of fixation may be present. Occasionally there is a bony protuberance extending from the foot-plate of the stapes into the vestibule. The most common portion of the stapes to be affected is the superior margin, and more particularly, the anterior portion of that margin. Sometimes the whole margin of the foot-plate of the stapes is fixed to the walls of the oval window and no trace of a joint remains, as in a case

described by Katz. The joint cartilages are, of course, destroyed in the process, but at certain portions where the annular ligament remains the cartilage is left intact.

When examined by the microscope it is found that this new growth of the bone is merely a portion of a change in the capsule of the labyrinth, which has extended into the joint and produced the changes just described. This change in the capsule is a very remarkable one and demands attention. It may occur at almost any point in the temporal bone, and, indeed, is frequently present in several places at once. It is not always limited to the capsule of the labyrinth, nor even to the temporal bone itself, as was shown by Katz ([6]) and by the present writer ([7]). Both these have demonstrated its presence in the anvil and hammer. It is even probable that the affection may be found in the bones of the head, for in the case described by the writer these bones were all remarkably porous and in a state quite different from that which is found in the healthy bone. For the present, however, we are concerned chiefly with the changes which occur in the capsule of the labyrinth and produce the condition of fixation of the stapes.

The point at which the change in the bone takes place is most frequently that portion of the capsule which lies immediately above and in front of the oval window. The change is not one of transformation of old bone into spongy tissue, but is the result of the absorption of old bone followed by the formation of new bone. The new bone is always spongy at first and may remain so. Frequently, however, it becomes transformed into dense bone. The new spongy bone is possessed of large medullary spaces, containing connective tissue rich in cells, and large thin-walled blood-vessels. The Haversian canals also are wider than under normal circumstances. The process begins by the osteoclasts absorbing the old bone. Side by side with this process of absorption new bone is laid down in the usual way by the osteoblasts, and the new-formed spongy bone may, in process of time, become dense once more. The new bone stains deeply with carmine and hæmatoxylin dyes, and the medullary spaces contain, in all cases in which the change is recent, a large number of multinuclear cells, wide blood-vessels with thin walls, and in some cases true bone-marrow. In later stages, if the new bone goes on to sclerosis, the cells become less numerous, the blood-vessels become smaller, and the medullary spaces are encroached upon and may ultimately disappear. As sclerosis progresses the affected part shows less and less affinity

for the stains of hæmatoxylin and carmine. This process is very gradual, and there is no marked line of demarcation between the sclerosed bone and the spongy bone from which it has developed. This is in marked contradistinction to the state of the bone in the early process of the disease; for, as stated above, at the beginning of the affection there is a very sharp line of demarcation between the new-formed spongy bone and the dense, healthy bone around it.

The most common point at which these changes appear is that portion of the bony capsule which lies immediately in front of and above the oval window. But in most cases this is not the only focus of disease, and it may be found in any part of the capsule of the labyrinth or in other parts of the temporal bone, and possibly sometimes in the other bones of the head. It is unnecessary to mention all the points at which foci of the disease have been noticed, but it may be stated that the modiolus has been found to be diseased and the ganglion spirale affected by the encroachment of the bone. The cavity of the labyrinth is sometimes encroached upon. Exostoses are not infrequently present, and occasionally the round window is very much diminished in area. In these cases it has been found that the hearing power is much more seriously affected than when only the oval window is the seat of the disease.

In the great majority of the cases which have been reported there has been found no change in the tympanic cavity. The mucous membrane is nearly always perfectly healthy and the Eustachian tubes clear and free from disease. The tympanic membrane is in the great majority of cases free from disease and is not indrawn. It is true that there are some exceptions to this general rule, such as have been observed by Habermann ([8]) in particular, in which thickening of the mucous membrane of the tympanum was found. Similar cases have been reported by Katz. In this connection it should be pointed out that the first of these observers has found that the various foci of the bony changes are most frequently located round the larger blood-vessels which pass in from the periosteum of the tympanum to the bone surrounding the labyrinth.

Pathogenesis.—When we come to consider the pathogenesis of the disease there is by no means the same agreement among investigators as is found in the results of anatomical examination. This is to be expected. It is one thing to ascertain facts which are left unchanged, or nearly so, by death, but it is quite another thing to elucidate the living physiological disturbance which has brought

about these anatomical changes. Indeed the matter must be to a great extent speculative.

There are several views as to the mode of origin of the disease. Habermann ([9]) and Katz ([10]) are of opinion that the source of the diseased process is to be found in an inflammatory action in the tympanum. Scheibe ([11]) also is of the opinion that in some cases in which definite changes are found in the tympanic cavity the disease begins in this way. In support of his view Habermann points out that the foci of the disease in the bone of the capsule of the labyrinth tend to group themselves round the blood-vessels which pass inwards from the periosteum of the tympanum to the bone. Katz also draws attention to the fact that this would account for the occasional occurrence of the disease in other parts of the temporal bone, such as the hammer and anvil. It will be pointed out later, however, that both these facts can be accounted for in quite a different way than that suggested by the writers mentioned. A very potent argument against the hypothesis put forward by these investigators is the fact that the disease is most often found without any evidence of present or past inflammation in the tympanum, and furthermore, foci of diseased tissue are found at points remote from the tympanic cavity and not in direct communication with the periosteum of that cavity. Finally it should be pointed out that there is never any evidence of inflammatory action in the bone, which we would expect if the disease were the result of inflammatory changes in the tympanum.

Siebenmann ([12]), as the result of his very careful investigations into the anatomical conditions, is of the opinion that the affection does not arise either in the periosteum or in the bone itself but in the cartilaginous layer of cells which lies between the original labyrinthine capsule of early life and the bone which is formed in the connective tissue of the skull and which ultimately surrounds the true capsule. He holds that the disease under consideration is a last phase in the general development of the bones of the body, a phase which is normal in the other bones but abnormal in the temporal bone.

Siebenmann's hypothesis has this important feature to recommend it to consideration; it accounts for the undoubted fact that there is throughout no sign of inflammatory action whatever. This objection is a strong argument against the view of Habermann, and, as will be seen later, also against that of Politzer. There are, however, great difficulties in the way of accepting the hypothesis suggested by Siebenmann. In the first place it does not at all

explain the very important involvement of the cartilage of the stapedio-vestibular articulation. It is quite conceivable that the cartilage cells which remain in the mass of the petrous portion of the temporal bone should undergo absorption and be replaced by bone in the way which occurs in normal osseous tissue, but that this process should occur in the cartilage of the joint is in the highest degree improbable. Indeed, it might be denied, without being too dogmatic, that such an occurrence is impossible unless we are willing to change our fundamental principles of physiological and pathological processes.

Politzer's ([13]) view of the disease is that it is an affection of the bone itself—an osteitis—and is independent of disease either of the periosteum, of the tympanum, or of the mucous membrane of the tympanum, or of the cartilage cells of the temporal bone. In other words, it is an inflammation of the bone itself. The obvious objection to this, as to most of the other views put forward, is that in the first place it does not explain the fact of the entire absence of any signs of inflammatory action throughout the whole course of the disease, whether studied from a clinical or a pathological point of view. Above all, it does not explain the peculiar sharp line of demarcation between the new-formed spongy bone and the whole compact bone around. The bilateral nature of the disease is also unfavourable to this view.

It has occurred to the writer that the incidence of the disease under consideration may be explained in a way quite different from those which have just been described.

Let us consider for a moment the salient features of the disease. It is very rare or practically unknown under puberty. It is almost uniformly bilateral, although one ear frequently suffers first and either may be the more seriously affected. It is rather more common in women than in men. It appears to a certain extent to be hereditary, but to judge from my own experience this is not such a common feature of the disease as one would expect after consultation with the text-books. There is no single general bodily condition to which the disease can be attributed, but several constitutional conditions seem to favour its development and certainly make it worse when once it has begun. Of these general bodily conditions the following are recognised: anæmia in any form, rheumatism, syphilis, pregnancy, gout. The anatomical features of the disease are: The absorption of small portions of compact bone and cartilage over an area or areas marked off by a sharp line of demarcation, the deposit of new-formed spongy bone in this

area, and finally the gradual transformation of this spongy bone into compact bone. Where the cartilage has been destroyed it is replaced by bone. Finally it must be remembered that throughout the whole course of the disease there is never any sign of inflammatory action.

Now, considering first the anatomical changes which occur without reference to the particular local conditions, it might be well to ask, What would a pathologist suspect if he found such a combination as a sharp line of demarcation, absorption of the tissue within that line of demarcation, and the subsequent laying down of new-formed tissue similar to that which has been absorbed? These facts are to be taken in association with the other important fact that throughout the whole course of the disease there is no sign of inflammatory action. Speaking as a pathologist, I have little doubt that I would suspect that there had been death of the tissue within the line of demarcation, and that the dead tissue was in process of absorption, infection not having occurred. The laying down of the new tissue similar to that which has been absorbed is, of course, the common law in pathology. In the opinion of the writer this really is the explanation of the occurrence of the disease. For reasons which will be given later the circulation in the minute vessels of the bone is very apt to become sluggish or to cease altogether for a time. It is very possible that thrombosis may even occur in the blood-vessels or capillaries referred to, and in either case the portion of bone supplied by the particular vessel would no longer be nourished and would die. Not being infected, the dead piece of bone would become surrounded by a line of demarcation and then be absorbed in the usual way, with the coincident laying down of new-formed bone which, as is always the case, is spongy at first and only becomes compact later.

The view expressed briefly above explains several peculiarities of the disease. In the first place, it explains the sharp line of demarcation between the new-formed spongy bone and the old compact bone. This line is quite comparable to the line of demarcation which forms in a gangrenous limb or the equally sharp line which defines the limits of an infarction. The remarkable absence of any signs of inflammatory action throughout the course of the disease is also explained by the theory given above. The important practical feature of the disease—that is, the fixation of the stapes in the oval widow by bony growth—is readily explained on the suggestion given by the writer. The cartilage of a joint is nourished by imbibition from the underlying bone. When there-

fore the bone on which the cartilage rests is dead, the cartilage itself dies. Hence the important feature of the disease from a practical point of view. The dead cartilage is never restored, but its place is taken by the new bone which is being formed in place of the old bone which supplied it with nourishment. Hence, I think, the explanation of the fact that in the majority of cases of fixation of the stapes the points at which the bridges of bone most frequently appear are along the anterior and superior margins of the bone—that is to say, at the part of the joint which lies nearest to the point of election of the disease in the bone itself.

But it may be asked, Why should the bone die so readily? At first it might appear that this would be a difficult question to answer, but a little consideration will show that there is a very good reason why the circulation should be carried on with risk in bony tissue and particularly in the bone which surrounds the labyrinth. The conditions of the circulation of the blood in the bone are different from those in any other of the tissues in one respect. The walls of the vessels in bone cannot collapse, and therefore when the force of the circulation is not strong enough to drive the blood through them the latter must stagnate. In the soft tissues, on the other hand, there is no necessity for this alternative, for if the force of the heart is not enough to drive the blood round the capillaries the atmospheric pressure comes into play, and the tissues diminish in bulk by the amount of blood which has been driven out of them. There is, of course, another factor in the case of the soft tissues—that is, the muscular coats of the smaller arteries, which may contract as soon as the blood-supply diminishes. The arteries of the bone have no muscular coats, and it would not avail them even if they had, for the walls of the vessels are so tightly bound to the bone itself that the muscular fibres could not possibly produce any diminution of the calibre of the vessel. We see, therefore, that the blood can be kept from stagnating in the smaller vessels of bone by two forces only—the action of the heart from behind, and the suction action of the respiratory movements acting through the jugular vein from in front. It is doubtful if the latter can be of very much avail in the case of the capillaries of the temporal bone; in any case, it must always be a very insignificant factor in the matter. There is, indeed, only one really active factor, and that is the contraction of the left ventricle. Unless the blood is driven through the capillaries of the bone by this force it will stagnate, and may

undergo coagulation if any disturbing factor should exist or if the stagnation is unduly prolonged.

Now, while this is the case in all the ordinary bones of the body, it is more particularly true in the case of the temporal bone, for the obvious reason that the Haversian canals are much narrower in diameter than in any of the other bones of the body. Therefore, while the force to drive the blood through the vessels is the same for the temporal as for the other bones, the amount of friction to be overcome is much greater in the case of the former, and stagnation is therefore much more likely to occur. It is, of course, well known that the blood will not coagulate, even in an indefinite time, in a vessel so long as the condition of the vessel-wall remains healthy. But under the circumstances we are considering just now, it is in the highest degree improbable that this condition of health of the wall would be present, for it also would not be supplied with healthy blood, and if in consequence it died, the blood contained within would coagulate at once. The thrombus having thus once formed, the rest follows as a matter of course. The blood cannot now get to the small surrounding portion of bone, and the latter dies and is absorbed in the usual way. The laying down of the new-formed bone is, of course, coincident with the absorption of the old. In fact, the appearances are exactly those which we find in the case of osteoporosis.

It will naturally be understood that there may be certain local and general conditions which favour the occurrence of the pathological changes in the way suggested by the writer. Thus it may be that certain individuals or even families may have rather narrower capillaries in the bone than others. Or it may be that the differences in the viscosity of the blood are enough to account for the various degrees of liability to the disease. So also various general conditions, such as anæmia, may favour the stagnation of the blood in the capillaries, or other diseases may favour the occurrence of the coagulation of the blood on the capillaries or smaller arterioles. Pregnancy, which has been looked upon as a cause of the disease, may be included under the same class as anæmia, since according to the views of the gynæcologists the condition of the blood in pregnancy is similar to that which is found to be the case in chlorosis. Of all the general conditions which seem to favour the onset of the disease, anæmia is in the writer's experience by far commonest. If aurists would remember to ask the patient the condition of health in which he or she was, not when they see the patient, but when the affection began, they would find that in the

great majority of cases among the female sex the disease begins when they are chlorotic.

It will, however, be inferred from the writer's statements that we must not look for one single general cause in the production of the local disease. Any general disease which affects the circulation unfavourably or produces alterations in the coats of the blood-vessels of the bone, or affects the viscosity of the blood, may be factors in the production of the disease. Thus it is easily conceivable that in one case chlorosis, in another syphilis, in another rheumatism or gout, may be the constitutional fault.

Again, it will now be quite conceivable that affections of the muco-periosteum of the tympanum may conduce to the occurrence of the disease. The cicatricial contraction of the tissue might act upon the smaller arterioles just before they penetrate the bone, and diminish the force of the blood-current. This would predispose to stagnation of the circulation in the bone and bring about the result described above.

But whatever the general conditions may be that give rise to the disease, the present writer wishes more particularly to suggest that the essential pathological basis of the disease is the death of circumscribed portions of bone and cartilage followed by the absorption of the same portions and by the deposit of new spongy bone to take the place of the bone and cartilage which has been absorbed. It appears to him that the anatomical changes which are found and agreed upon by all are best explained by that suggestion.

1. Morgagni.—"De Sedibus et Causis Morborum," 1767.
2. Valsalva.—"Tract. de Aure Humana," chap. ii, x, s. 22, 1742.
3. Meckel.—"Inaug. Dissert.," Halle, 1777.
4. Toynbee.—*Med.-Chir. Trans.*, 1849, p. 69; 1855, p. 1.
5. Voltolini.—*Monatschr. f. Ohrenh.*, 1876, s. 150.
6. Katz.—*Arch. f. Ohrenh.*, Bd. liii, s. 68.
7. Gray.—*Brit. Med. Journ.*, October, 1905.
8. Habermann.—*Arch. f. Ohrenh.*, Bd. lx, s. 37.
9. *Ibid.*
10. Katz.—*Loc. cit.*
11. Scheibe.—*Verhandl. d. Deutsch. Otol. Gesellsch.*, Breslau, 1901.
12. Siebenmann.—*Zeitschr. f. Ohrenh.*, Bd. xxxiv, s. 356, and s. 291.
13. Politzer.—*Zeitschr. f. Ohrenh.*, Bd. xxv, s. 309.

Discussion.

Mr. L. A. Lawrence, in discussing the diagnosis of fixation of the stapes, disputed the accuracy of the three symptoms on which the diagnosis was usually made—viz. a negative Gellé's test, para-

cusis, and increased bone-conduction. The objections taken to Gellé's test were, first, the plugging of the meatus; secondly, the placing of the tuning-fork on the bone. With regard to paracusis, the old definition was the ability of a deaf person to hear better in a noise. Mr Lawrence thought it was not noise but the vibration which caused the noise that gave rise to the increased hearing. He thought it would be found as a rule that people with paracusis heard better in a hansom cab with silent tyres than in one which had iron tyres. In a train the same person heard better when in the open, but worse when the train was passing through a tunnel. In both these cases the added noise due to the iron tyres and the tunnel did away with a large part of the extra hearing. Some members of the Society who had consulting-rooms abutting on a road without a wood paving would surely recognise the effect of noise in diminishing the hearing power of nearly all their patients if they tested them during the passage of some heavy traffic. If increased hearing was thus caused by physical vibration, clearly there must be something inside the ear capable of being shaken and moved. Now, the only movable adjuncts which he knew were the chain of bones and the organs in the inner ear. These latter might be left out of consideration, as no observer had ever brought them forward as being at fault. There remained only the chain of bones. If the shaking up of this could produce a return of hearing, clearly the stapes could not be fixed, and therefore he thought that paracusis with regard to the diagnosis of fixation of the stapes showed mobility rather than fixation. As regards increased bone-conduction, he did not think any one had yet brought forward adequate grounds for explaining the phenomenon or for showing any connection between it and fixation of the stapes.

Dr. Dundas Grant said the subject for debate was what one speaker had already spoken of as one of the darkest subjects in otology, and he had no doubt many, especially in the beginning of their career, had felt, as he himself did, the hopelessness and despair in seeing certain patients, not the least attractive of one's clientele, who were the subjects of that affection, namely, otosclerosis or fixation of the stapes. That condition was comparatively frequent in young women. It was of the greatest interest to him to hear Dr. Gray propound his theories, because that gentleman's remarks so completely explained conditions which had somewhat perplexed him (Dr. Grant), and which were present in certainly one class of case. There were, no doubt, many classes

of cases which, from the otological point of view, it was necessary to differentiate as far as possible. The otosclerosis of young women was one very definite class. He believed it to be associated with an enfeeblement of the circulation, and the patients were usually those to whom one applied the term "chlorotic." In many of them there were some of the signs of osteoarthritis, sometimes well marked in the individual, sometimes in the female progenitor, or it might be that some of the less pronounced prodromic signs pointed out by Luff and Ballantyne, such as a clammy coldness of the extremities, were there when the pronounced signs were as yet absent. He dwelt upon such a point in etiology because he thought the difficulty connected with the future operative treatment of the condition—if there should be a future operative treatment—would depend upon whether the cause of the progressiveness of the disease was discovered. If the disease were simply a finite fixation, one might carry out such plans as those propounded by Panse or by Milligan, or other progressive aural surgeons, with some hope. But the discouraging feature about the condition was its tendency to progressiveness, even though this did not always show itself. It, therefore, differed from simple fixation due to some accidental process. For that reason he pleaded for a careful investigation into the etiology of cases, and Dr. Gray's explanation helped one a long way in that direction. He believed Gellé's was a very valuable test, and offered a strong confirmation, other things being present, of the fact of the stapes being fixed. There were certain difficulties with regard to it. Mr. Lawrence had pointed out some of them, and lack of understanding on the part of the patient might make a great difficulty; a "negative" result of Gellé's test was probably valueless in cases of fixation of the malleus or of considerable relaxation of the tympanic membrane. He considered that the difficulty pointed out by Mr. Lawrence in regard to plugging the meatus was not a very serious one, because one tested the dying away of the sound of the tuning-fork while the meatus was plugged up and tested it again while compressing the Politzer bag, the ear being again plugged; we thus compare like with like. The only effect of the plugging was to lateralise the sound in the ear which it was desired to test. So far as he had looked into the results of Gellé's test in his hands, he was distinctly of the opinion that the prognosis was materially worse in cases in which Gellé's test was negative. But there was, however, an hiatus in his experiments with it, because he had used it chiefly in those cases where he thought beforehand there was likely to be fixation of the stapes.

He had not applied it indiscriminately to cases in order to find out with what regularity the test was positive in other conditions. To the view that the stapedo-vestibular synchondrosis or joint might be liable to osteoarthritis, it had been objected that it could not be osteoarthritis in the ordinary sense, because the joint had no synovial membrane. He admitted there was much force in that, and that it was those joints having synovial membrane which were much more open to infection than others. But he took his difficulty to a gentleman who was perhaps one of the leading authorities, and he said he did not think the absence of synovial membrane was at all an objection. Some authors had taken exception to the term "ankylosis of the stapes" altogether, because it postulated that there was a joint there, whereas it was not, properly speaking, a joint, and therefore it should be called a synostosis. This change in nomenclature might be worth discussion. Another alteration in nomenclature was that mentioned by Mr. Lake, the application of the term "vestibule" to the niche for the fenestra ovalis, but the term "vestibule" was already employed for the cavity on the labyrinthine side. Another point which had not been mentioned was the flamingo-red crescent referred to by Schwartze, which in his (Dr. Grant's) experience was absent in many cases but present in some. No doubt the significance of that crescent was that there was a congestion on the surface of the promontory, and that it was seen through the tympanic membrane in so many cases of synostosis of the stapes because the tympanic membrane preserved all its transparency. He concluded by expressing his great regret at the absence through illness of Mr. Lake.

Mr. Macleod Yearsley desired to emphasise the importance of more careful and accurate work with regard to tuning-fork tests amongst otologists. Very often one heard notes read of cases in which the tuning-fork tests given were most meagre. He especially emphasised the necessity of a greater uniformity of tuning-fork tests and for reporting them; it would even be worth while for the Society to take up the matter, and, if possible, formulate some system which could be universally adopted. He supported Mr. Lake's remark as to the great improvement in cases of fixed malleus alone which could be gained by mobilisation. Possibly a very fair number of cases might be met with in which deafness was very largely due, or almost entirely due, to the fixation of the malleus, possibly to some superficial contraction of the tensor tympani tendon. Those who had carefully dissected fresh specimens would have noted that that tendon was inserted into the

bone with a small fan-shaped expansion running downwards, and it had often occurred to him that a cicatricial contraction following inflammation of that tendon might help very largely to fix the malleus. A case which he saw at the Royal Ear Hospital a few weeks ago was that of a man, aged forty-five, with fixed malleus. He could not take the tuning-fork tests, on account of the noise in the room, but he was tested roughly about five minutes before gas was given him and his malleus mobilised. A voice could be heard at 2 feet, a whisper at 6 inches; the watch was not heard at all. Five minutes after the malleus was mobilised the watch could be heard at 9½ inches, the voice at 4 feet 6 inches, and the whisper at 1 foot 6 inches. That illustrated the improvement which could be gained by simple mobilisation of the malleus. Another point in which he supported Mr. Lake was with regard to the red iodide solution. He had found, as Mr. Lake had, that it improved a good many cases which had paracusis Willisii. He agreed with Dr. Dundas Grant that the pink blush was absent in many cases, and when it was present it was more likely to be over the promontory. He remembered a case of Mr. Lake's in which the salmon-pink blush on one side was over the promontory and on the other side over the region of the stapes. In that case the side where it was over the region of the stapes did not improve, but the other side did somewhat improve under treatment. With regard to the amount of bone-conduction, his own experience was that a *plus* bone-conduction was fairly common in early sclerosis. He presumed that was due to acoustic hyperæsthesia, probably caused by the irritation of the process going on in the wall of the capsule. A short time ago he saw a very curious case, which he took to be early sclerosis, in which the bone-conduction was markedly increased. The patient was a healthy country girl, aged fifteen. Deafness had been noticed, worse in the right ear, twelve months. But it had only been noticed during the catamenia, according to her mother. There was a drumming tinnitus at that time, of which only a vestige remained in the intervals. During the periods there was also occasional vertigo. There was no paracusis Willisii. He had been unable to obtain any history of trouble likely to lead to deafness. Both membranes were normal; they showed no blush and their mobility was unimpaired. There was very marked carotid pulsation. He tested the patient at the height of a period, and again a fortnight afterwards, and during the period there was + 14 inches on one side and + 12 inches on the other side. Between periods it was + 5 inches and + 6 inches; and he men-

tioned that as an instance of bone-conduction in early otosclerosis. One other point he would like to draw attention to. There were two classes of case that every otologist must have observed—children and parturient women. One sometimes met with children who were deaf and in whom the removal of adenoids resulted in no improvement. And then there was the accentuation of the condition after parturition. Pregnancy did not appear to accentuate otosclerosis, but parturition certainly had that effect. It had occurred to him that valuable light might possibly be thrown on the disease if blood-counts were taken in such cases.

Dr. Barr explained that Dr. Milligan had been compelled to leave to catch his train, but desired him to mention that he had twice done the operation which Dr. Pritchard mentioned as a possibility in the future, namely that of perforating the inner wall of the tympanum and forming a new fenestra. Dr. Milligan grafted the orifices, but the results had been practically *nil*, as the hearing and the subjective symptoms remained, after a short period of improvement, pretty much as they were before the operations.

Mr. C. E. West, referring to Dr. Milligan's cases, said that about a year ago he operated upon a woman aged forty-five to fifty. She was very deaf on both sides, and was very anxious to hear and ready to have anything done. She had a complete operation done and then the promontory was opened, and, as one so often saw in any fresh *post-mortem* specimen, if one scraped through the bone carefully, the lining membrane, or periosteum of the labyrinth, formed a diaphragm across the opening in the bone. No perilymph was seen, and he did not graft it, but left it as it was. It behaved like a post-aural operation; there was never suppuration, and it all healed. But at the end of the time the condition was the same as before. As in Dr. Milligan's cases, she heard better during the process of healing than she heard either before the operation or after the healing. Her hearing was so good during the healing that she could make out a good deal of the sermon preached in the ward. He still saw the patient occasionally, and she was no better than at first. There was a firm, shiny scar over the whole inner wall of the cavity, and one could not see where the promontory was attacked. He could not say whether the hole was filled up by bone.

The President said he thought all would agree that exceedingly valuable papers on the subject had been read; he did not believe there was much known on the subject that had not been laid before the meeting. The cordial thanks of the members were due

to the readers, and perhaps especially to Dr. Albert Gray, who had brought forward matter which was pregnant with thought for the future guidance of otologists. Dr. Gray had mentioned several things he (the President) had not known before. His suggestions on the possible causation of otosclerosis were particularly valuable. He (the President) had nothing special to say on the subject, but he thought the British otologists should be defended from the observations of Dr. Barr, that "the names of British otologists were conspicuous by their absence" from the literature on this subject. Owing to public opinion, *post mortems* could not be obtained in this country as readily as on the Continent, and it was not that British workers in this field were not as earnest as their continental brethren, but their opportunities of following their clinical knowledge into the *post-mortem* room were extremely limited. With regard to Gellé's test, he considered it extremely unreliable; whether due to the inaccuracy of the patient tested or the inaccuracy of the test itself he could not say. He had obtained most contradictory results by its use and he had ceased to have any faith in it.

TWENTY-SEVENTH ORDINARY MEETING.

Saturday, June 23rd, 1906.

THE PRESIDENT, MR. A. E. CUMBERBATCH, IN THE CHAIR.

The following communications were made:

CASE OF DEFECTIVE HEARING FROM CHILDHOOD; CONSIDERABLE RECOVERY.

BY H. SECKER WALKER.

Miss E. W—, aged fourteen. Influenza at seven months of age. Seen by Dr. Barrs at six years of age. The hearing then was defective; she understood what she saw and touched and was quite intelligent and could say a few words indistinctly. She had been brought up and educated as a deaf mute, living for several years with a very excellent teacher of lip-reading. She could follow this lady's utterance and speak fairly clearly, but had much difficulty when nervous or with strangers.

When seen by Mr. Walker on February 27, 1906, both tympanic membranes were dense and white; there was slight but not marked retraction. She could not hear the watch at all and only loud sounds. Some improvement was noted after inflation with Politzer's bag. She can manage lip-reading very fairly well, and on being asked said the ears felt more open. After using the air-douche a few times the catheter was tried and further improvement obtained.

March 3.—Watch $\frac{1}{2}$ in. right and left (normal 48 in.). Has never heard a watch before except on contact. After catheter $2\frac{1}{2}$ in.; a raised voice at 18 in. March 6: 2 in., catheter 8 in. March 9: 7 in., catheter 15 in. March 12: 20 in., catheter 30 in. March 17: 24 in., right 27 in.; left 21 in. Can speak better and hears many out-door sounds for the first time, and words without watching the speaker's lips. The hearing for a watch remains at about 24 in. right and left, and patient is gradually learning, as a small child, the meaning of the various word-sounds.

Partial Necrosis of Cochlea and Sigmoid Sinus Thrombosis.

By H. Secker Walker.

The patient when twelve years old was struck on the head. Next day in the right ear there was pain and discharge, and vomiting, followed shortly by rigors and sweats. A subperiosteal mastoid abscess was present. The strabismus present was concomitant, not paralytic. On opening the superficial abscess a sinus was found passing into the mastoid antrum. This was freely opened, and several sequestra removed from the postero-internal wall. The lateral sinus was exposed and opened for a considerable distance. A quantity of septic and breaking-down clot was removed. The complete mastoid operation was then done. In a week's time there was a return of the vomiting and some drowsiness, slight right optic neuritis, and retraction of head. The lateral sinus was further exposed and washed out, and a post-pharyngeal abscess opened in the neck beneath the deep vessels. After two small sequestra had come away from the middle ear, complete healing followed this operation. The first was, unfortunately, thrown away by the nurse, the second was found to consist of the lower turn of the cochlea.

Lately there had been a return of suppuration in the neighbourhood of the fenestra rotunda, which was rapidly dwindling under treatment. The operations were done six years ago, and the case was recorded at a meeting of the Society in London on June 10, 1901.

The boy can hear (when the left ear is excluded) tuning-fork C. 128 close to the ear, C. 256, C. 512, C. 1028, C. 2048 at six inches; Galton's whistle; Rinne + right ear; Weber + to right side. The specimen showed part of the cochlea from this patient's right ear.

Dr. Urban Pritchard remarked that the first case was an illustration of what they all had met with, namely, that in examining so-called deaf-mutes one finds a large proportion of them with a certain amount of hearing. In this case the small amount of hearing that remained had been neglected, but by using educational treatment a certain amount was regained. It was very important for a large number of these so-called deaf-mutes, who possess a little sense of sound, to give them this little extra hearing in order to improve their talking, and thus to increase their powers of communicating with the world. The second case was particularly

interesting to him, because he once saw a similar specimen exhibited by the late Dr. Cassells, of Glasgow, taken from an ear which still retained some hearing. Dr. Pritchard's sceptical nature at that time made him doubt the accuracy of Dr. Cassells' statement. Now he felt that he was utterly wrong in doubting Dr. Cassells, because he had tested this patient and was quite satisfied that the sense of hearing was present.

Dr. Dundas Grant said, in the case of the young girl who came under the definition of deaf-mute, there was no doubt that Mr. Secker Walker had conferred an enormous boon upon her as far as her safety in life is concerned, though it was very questionable whether she would be able to hear speech. Dr. Grant had seen cases recorded of cures of deaf-mutes by the removal of adenoids or other simple means, but he had not been lucky enough to have any of these cases in his own practice. The case of loss of cochlea was certainly a very interesting one, and there was ample room for discussion upon it. It seemed, however, to be quite unquestionable that the boy heard through that ear. Whether the sound was received by a remnant of cochlea or was conveyed through the nerve of the opposite side was a very difficult question. Weber's test for the exclusion of disease in the labyrinth was certainly unreliable, in suppurative cases at all events.

Mr. Macleod Yearsley, with regard to the first case, inquired how long the patient had been under Mr. Secker Walker's treatment, and how often she had been catheterised, because he thought in many cases satisfactory results might be obtained by perseverance. He also inquired about the condition of the nose and post-nasal space with a view of arriving at the cause of the deafness apart from the influenza. With regard to Weber's test, Mr. Yearsley thought it was probably the most unreliable and the most useless test they had except in cases of purely unilateral deafness.

Dr. Adolf Bronner was of the opinion that cases were not uncommon in which a child who was apparently a deaf-mute could be made to hear fairly well by having the ears attended to. He generally advised mercurial inunctions and frequent blisters behind the ears, and Politzer's bag, or if possible the Eustachian catheter. He considered that a case should never be given up until rational treatment had been tried for a considerable length of time.

Dr. D. R. Paterson said there was no doubt there were a great number of these cases about, and that particular case might be cited as an example of what the Society was doing in the matter.

Professor Hartmann, of Berlin, had taken this matter up, and from his position on the Berlin School Board he had been able to set apart special schools, where the children who are only partially deaf are taught, and, according to his last report, his experience is that considerable good is being done.

Mr. R. N. Hartley said this case was interesting from the educational side, and without in the least detracting from the improvement that Mr. Walker had been able to bring about in the girl's condition, he would remind members of the favourable circumstances which existed with regard to her education. She was a girl of considerable intelligence—more than would ordinarily be found in other defective children of the same age, although, of course, the education of the deaf and partially deaf had been immensely improved nowadays by the operation throughout the country of Mr. Acland's Act for the compulsory education of deaf-mutes. There was in Leeds a school of 125 so-called deaf children. Although some of them possessed very little hearing, the very fact of their being at school, apart from treatment, improved them both in intelligence and in hearing. Those who possessed partial hearing seemed, in a sense, to instruct themselves or become helped in their difficulty by the mere fact of their being better educated and from being constantly in the society of people whom they could follow. It seemed the association of other people and the methods of education now in vogue in such a school would form a line of observation which would throw some light on this particular case. It should be remembered that in the case of this girl of fifteen years of age she was put to reside as an adopted child in the private house of the headmaster of a large deaf-mute institution, and that every possible care was taken to accustom her to speaking, hearing, and being amongst people, so that she had every chance from that time.

Dr. W. Milligan said the practical rule which he had adopted for some time past was not to label any child as a deaf-mute until that child had had a course of treatment by the local practitioner—*e. g.* inflation with Politzer's bag, etc., for a period of a month. At the end of that time, if there were no change in the condition, one was justified in coming to the conclusion that nothing further could be done. At the same time, in reference to what Mr. Yearsley mentioned, it was of the utmost importance that before any treatment is entered upon a thorough examination of the naso-pharynx should be made. It was important that all patients should be energetically treated, and it was a useful thing to use counter-irritation over the

mastoid process. The mere fact that a child acquired even the rudiments of hearing showed that he derived benefit therefrom, and he was undoubtedly more easily taught if he possessed very small hearing than if he has no hearing at all. Before condemning a child as a deaf-mute local treatment should be given for a month, which might or might not be of some advantage.

Mr. A. L. Whitehead remarked in reference to what Dr. Hartley had said that there could be no doubt, as he had seen in Professor Urbantschitsch's Klinik in Vienna for the training of the deaf mutes, that although actual sound perception might be little improved, yet at the same time the sense of intelligent appreciation of sound could be very much educated.

The President agreed with Mr. Walker that the physical improvement to the ear had educated the auditory centre by increasing the intensity of the vibrations which reached it. It was in that way that the child had improved. The President was reminded of a case he saw years ago—a medical man's child—who was not as deaf as the case in question, but was very deaf. He treated him in the ordinary way, but was struck by the father's saying that there were certain sounds the child could never hear. After seeing him for a time he came to the conclusion that a good deal of the deafness was mental. As time went on it proved to be so. He saw him eight or nine years after, and tested by a watch and a tuning-fork found the hearing to be practically the same, but for speech it was nearly normal. The President saw the father two or three years ago, and learnt that the patient, who was then in India, had written about the same time to the effect that certain sounds still bothered him every now and then. A letter or part of a word would often be missed, but for all intents and purposes he heard quite well. He felt sure that if a certain amount of mechanical hearing could be given to a patient, a great deal might be done to improve imperfect mental hearing.

Mr. Walker, in reply to Mr. Yearsley, said that in Case 1 the ears had been inflated some fifteen times by himself, and for the previous month by her teacher on alternate days. The nose was healthy and no adenoids were present. He attributed the deafness to the influenzal attack when the patient was seven months old.

Chronic Mastoid Disease; Subdural Abscess.

By H. Secker Walker.

A. W—, aged thirteen, was admitted on account of profuse

otorrhœa from the left ear, accompanied by continuous temperature of 100° F. to 101° F., no pain, vomiting, or rigors.

Mastoid operation, January, 1903. A large cavity containing a sequestrum was exposed, pus exuded through a small opening in the roof of the antrum. The tegmen antri was removed, and subsequently that of the attic, and a large subdural abscess with thick walls was found and drained. After briskly swabbing the cavity with pure carbolic acid the dura was incised and the temporo-sphenoidal lobe exposed, without result. The bone cavities were then well cleansed out, and at a later date the cavity was lined with a large skin-graft. The abnormal size of the cavity was explained by the large sequestrum removed.

Epithelioma of the External Auditory Meatus.

By H. Secker Walker.

Mrs. J—, aged fifty-three, for three years had had pain, with occasional attacks of bleeding and discharge of pus from the left ear. When seen on February 28, 1906, the meatus was swollen and inflamed, chiefly on the anterior wall. Much pain and considerable amount of pus was present. A circumscribed external otitis was diagnosed, and a deep incision made into the swelling; no pus was found.

When seen again in a month, the pain was less but the swelling was still present, and there was distinct hardness of the tragus and surrounding tissues. No enlargement of glands was detected.

The whole growth, as far as possible, was excised, and during the healing the patient was submitted to the X rays under the supervision of Mr. Constable Hayes.

Sections under the microscope prepared in the Pathological Laboratory of the Infirmary showed the growth to be an epithelioma.

Epithelioma of the Pinna; Amputation.

By H. Secker Walker.

When seen on April 2, 1902, F. P—, aged fifty-four, had noticed a small pimple with a black head on the pinna for six years. Recently it had grown larger. The edges of the growth were hard. There was some infiltration in the neck just below the ear. The ear was subsequently removed, including the cartilaginous meatus and the infiltrated portion in the neck.

The pathological curator reported that the growth was a squamous-celled carcinoma with formation of cell-nests.

Exhibition of Cases.

By A. L. Whitehead.

(1) A case of acute cerebral abscess. Chronic bilateral otorrhœa for twelve months. Headache and vomiting twenty-four hours, followed by coma. Acute temporo-sphenoidal abscess, without limiting membrane, opened and drained. Double radical mastoid operation.

(2) A case of cerebral abscess. Left otorrhœa three months. Headache and vomiting fourteen days. Left pupil smaller than right; semi-coma. Large, very foul, temporo-sphenoidal abscess.

(3) A case of cerebellar abscess. Right otorrhœa two years. Headache and drowsiness fourteen days. During performance of radical operation track found leading to cerebellar abscess.

(4) A case of bilateral cerebral abscess. In 1901 had large left temporo-sphenoidal abscess opened for coma, vomiting, etc. In 1903 a similar abscess developed on right side with similar symptoms. On each occasion patient was almost moribund before operation.

(5) A case of sigmoid sinus thrombosis extending down the internal jugular. Rigors, vomiting, and remittent temperature. The internal jugular was excised nearly to the clavicle.

(6) A case of sigmoid sinus thrombosis in which the internal jugular was excised.

(7) A case of sigmoid sinus thrombosis in which a portion only of the internal jugular was excised.

(8) A case of acute double mastoid disease following influenza. The whole of both mastoid processes was completely destroyed.

(9) A case of chronic otorrhœa, with necrosis of the labyrinth. A sequestrum composed of part of the cochlea and the semicircular canals was removed.

(10) A case of chronic otorrhœa, with necrosis of the labyrinth.

(11) A case of chronic otorrhœa, with vomiting, headache, coma, and slow pulse. A radical mastoid operation relieved all symptoms.

Mr. Whitehead said the first case he had already reported to the Society; the second was interesting on account of the left pupil being smaller than the right; the fourth case, unfortunately, could not be present. She married since the second operation, and

was now having a third child. The eighth case was the most extensive one of its character he had ever seen, practically no bone being left either above, behind, or below; one side was grafted. The patient hears very much better on the non-grafted side. The eleventh was a rather interesting case because he had suspected the presence of a cerebral abscess; but he did not explore the brain. After the radical operation everything cleared up satisfactorily.

Mr. Yearsley asked whether Mr. Whitehead still followed the practice of grafting, whether he had given it up, or whether he did it more often than he used to.

Dr. Milligan asked in regard to Case No. 11 whether Mr. Whitehead considered it to have been a case of serous meningitis. Dr. Milligan believed it to be a condition difficult to diagnose in connection with suppurative disease.

Dr. Logan Turner asked whether in this case the cerebro-spinal fluid was examined, and whether it might not have been a case of serous meningitis.

Dr. Bronner considered that in Case 11 there could not have been any meningitis because the symptoms came on so quickly. Similar symptoms were sometimes seen after chloroform.

Dr. Pritchard was greatly interested in these cases of paralysis of the sixth nerve producing squint; the course of the nerve was so short that there was no difficulty in localising the seat of the mischief, which must be some inch or inch and a half from the original disease in the middle ear. He did not consider that the paralysis was due to pressure of cerebro-spinal fluid but rather to localised meningitis. Whatever might be the cause they were all agreed that recovery nearly always followed the mastoid operation.

Mr. Whitehead, in replying, said with regard to Mr. Yearsley's question that he still grafted all his cases because it economised time in the healing process. He found it of great advantage, particularly in hospital cases. In regard to Case 11 he did not explore the brain on finding no disease in the tegmen. He waited twenty-four hours before proceeding with the operation, and the improvement within the next few hours was so great that he did nothing further. With regard to serous meningitis it was a very convenient term which they used to cover the group of symptoms resembling those occurring in purulent meningitis but terminating in recovery. There was in his record practically no case of death resulting from serous meningitis. He did not know of any case

where a satisfactory *post-mortem* examination had been made, showing that death had resulted from it. One could call it serous meningitis, and no one could gainsay whether it were so or not. There must have been some great disturbance in the brain to give rise to those symptoms, and to call it serous meningitis was perhaps a convenient expression for the present for want of a better term. In reply to Dr. Paterson's question, Mr. Whitehead thought it better to cut away freely the posterior meatal wall, and so obtain a funnel-shaped opening through which there was no difficulty in applying the dressing.

Pathological Preparations of the Temporal Bone.

By H. Secker Walker.

Mastoid and Vestibular Suppuration.

Left temporal bone of a child the subject of mastoid disease. The patient had the usual complete mastoid operation performed. A small patch of disease remained posteriorly. The child did not return to hospital for a year, and then this was noticed to be still present, and there was some pus lying in the fenestra ovalis. Several attacks of epileptiform convulsions with subsequent rigidity and paralysis. The symptoms suggested tubercular meningitis, but in the presence of the suppuration it was decided to operate further. The present opening into the cerebellar fossa was made and no pus found. The chisel and small electric burr were used and the horizontal semicircular canal cut away. Anteriorly the burr opened the ampulla and entered the vestibule. The burr then was taken through the fenestra ovalis and fluid syringed through the vestibule. No facial paralysis occurred. The canal of the facial nerve was accidentally opened in preparing the specimen. The child died three days later from tubercular meningitis.

Sigmoid Sinus Thrombosis.

Part of the right side of a skull of a child nine years of age. The bone over the lateral sinus had been removed and the mastoid cells and antrum and middle ear opened. A septic thrombus extended from near the middle line behind to the jugular bulb. The outer wall of the venous sinus was removed after plugging the vein near the torcular; the jugular vein opened in the neck low down, and, after syringing through into the lateral sinus, was ligatured. Scarlet fever four years previously, followed by occasional otorrhœa.

Severe headaches, chiefly on the right side, during the month before admission, vomiting for one week, diminishing discharge, with increasing pain in the ear and head, followed by drowsiness. Temperature 102° F., pulse 116, respirations 40. Death from shock. No meningitis or cerebral abscess.

Professor L. Miall read a paper on *The Organs of Hearing in the Lower Animals.*

Some Points in the Diagnosis of the Complications of Temporal Bone Disease, based upon a Study of 135 Fatal Cases.

By A. L. Whitehead.

Isolated cases of intra-cranial suppuration which have been brought to a successful issue are frequently published, but a careful study of the symptoms in these cases is rarely instructive—either the symptoms were of the most obvious character or else the cases recovered by a fortunate association of fortuitous circumstances.

During the last fifteen years 892 cases of temporal bone disease were operated upon at the General Infirmary at Leeds by our predecessors, my colleagues, and myself. Of these cases 146 died.

A study of these fatal cases, where careful *post mortems* revealed lesions in some cases unsuspected during life, or with symptoms rendering a correct diagnosis a matter of the greatest difficulty, presents many interesting features. I regret, however, that I have no very striking conclusions to lay before you.

Of the 146 cases, 11 died from other causes, such as diabetes, cardiac disease, etc. In the remaining 135 cases death was more or less directly referable to the temporal bone disease.

Eleven cases died from exhaustion; 10 of these were wasted infants under one year old; all had very extensive mastoid disease and subnormal temperature after operation, and died of inanition in from ten to thirty days afterwards. In two of these cases necrosis of the labyrinth was found. The eleventh case was two and three quarter years old, and had chronic diarrhœa, with acute mastoid abscess, associated with vomiting, rigors, retraction of neck, drowsiness, and constipation. She was almost moribund on admission to the hospital, revived under stimulants, but died of shock at the completion of an extensive operation. Nothing abnormal in the brain or elsewhere was found at the *post mortem*; a culture of the pus gave no growth. In this case the symptoms pointed to intra-cranial suppuration, and it was necessary to explore

the brain; the prolonged operation undoubtedly proved fatal, but a less complete operation would not have been justifiable.

In young children with defective stamina it is certainly wiser not to aim at complete removal of all disease at one operation; the establishment of good drainage and the removal of the more serious disease should be accomplished at the first stage, and at a later period a more complete and satisfactory radical operation performed.

In 2 cases no obvious cause for death was discovered at the *post mortem.* One case, where persistent vomiting, optic neuritis, coma, nystagmus, and conjugate deviation of the eyes were present, I have already reported to the Society.

In the second case two serious and alarming hæmorrhages, with persistent uncontrollable oozing from the whole of the wound in the bone and not at all from the soft parts, were followed by jaundice, temperature of 102° F., and collapse. The organisms obtained from the pus were streptococci, and anti-streptococcic serum was injected without success. At the *post mortem* no gross lesion of any organ was found. Probably in both cases an acute septic injection caused death.

In 22 cases acute miliary tuberculosis caused a fatal issue; in 18 the meninges were affected and the symptoms those of tubercular meningitis.

In 8 of the 22 cases some other primary forms were present, but in the remaining 14 the temporal bone disease seemed to be the sole focus of infection. Nineteen cases were under two years of age. In every case either symptoms of tubercular meningitis or distinct evidences of general tuberculosis were present before operation, and in no case could the operation be regarded as the originating cause of a general disseminated miliary tuberculosis.

In 5 cases when admitted an ordinary catarrhal pneumonia complicated an acute mastoid disease following upon chronic otorrhœa, the pneumonia proving fatal.

In 3 cases an extra-dural abscess situated over the sigmoid sinus was evacuated during the mastoid operation, death subsequently ensuing from septic broncho-pneumonia.

In 3 cases rigors and remittent temperature had preceded operation, but the sinus was found to contain fluid blood. No septic thrombus or alteration in the vessel-wall was found *post mortem,* although the infection must clearly have been conveyed through the sinus. No uncomplicated case of extra-dural abscess died.

	Cerebral abscess, 9 cases.	Cerebral abscess with meningitis, 6 cases.	Cerebral abscess with cerebellar abscess, 2 cases.	Cerebellar abscess, 10 cases.	Cerebellar abscess with meningitis, 5 cases.	Cerebellar abscess with sinus thrombosis, 6 cases.	Sinus thrombosis, 1 case.	Sinus thrombosis with pneumonia, 9 cases.	Sinus thrombosis with meningitis, 10 cases.	Meningitis, 33 cases.
Headache	9	6	2	9	5	5	—	3	4	21
Vertigo	1	1	—	2	—	3	—	—	—	2
Vomiting	7	4	2	5	5	3	—	3	6	12
Slow cerebration	5	—	1	2	1	—	—	—	—	—
Drowsiness or coma	6	3	1	6	1	4	—	—	—	9
Constipation	2	4	—	2	1	1	—	—	—	—
Subnormal temperature	2	1	2	2	—	1	—	—	—	—
High temperature	—	5	—	—	4	3	1	9	10	29
Remittent temperature	—	—	—	—	1	—	1	9	10	29
Slow pulse	2	1	2	2	—	1	—	—	—	—
Rapid pulse	—	5	—	—	—	—	1	9	8	15
Slow respirations	2	1	2	—	—	1	—	—	—	—
Rapid respirations	—	—	—	—	—	—	—	9	—	—
Optic neuritis	5	—	—	2	—	1	—	2	3	8
Pupil dilated on side of lesion	1	—	—	—	—	—	—	—	—	—
Pupils unequal	—	—	—	—	—	1	—	—	—	3
Paralysis of limbs on side of lesion	—	—	—	—	—	—	—	—	—	—
Paralysis of limbs on opposite side	1	1	—	—	—	—	—	—	—	2
Deviation of eyes to lesion	—	1	—	—	—	—	—	—	—	2
Deviation of eyes from lesion	—	—	—	—	—	—	—	—	—	3
Strabismus	—	1	—	—	—	—	—	—	1	1
Nystagmus	—	—	—	2	—	1	—	—	1	—
Knee-jerks absent	3	1	—	—	—	2	—	—	—	2
Knee-jerks increased	—	—	—	—	—	—	—	—	—	2
Retraction of neck	—	—	—	1	—	1	—	—	1	4
Muscular twitchings or contractions	—	—	—	—	5	—	—	—	7	12
General convulsions	—	1	—	1	4	—	—	—	10	—
Delirium and mental excitement	—	5	—	—	5	1	1	—	7	7
Rigors	—	—	—	—	—	2	1	8	5	1
Tenderness over jugular	—	—	—	—	—	—	1	—	—	1
Age under ten	—	—	1	1	1	1	—	3	4	16
„ between ten and twenty	4	4	1	3	3	3	1	6	1	5
„ between twenty and forty	4	2	—	5	1	2	—	—	5	7
„ over forty	1	—	—	1	—	—	—	—	—	—

Of the remaining 93 cases, serous meningitis was present in 1, general meningitis in 33, meningitis and sigmoid sinus thrombosis in 10, meningitis and cerebellar abscess in 5, meningitis and temporo-sphenoidal abscess in 6, sigmoid sinus thrombosis alone in 1, with pneumonia in 9, with cerebellar abscess in 7, temporo-sphenoidal abscess and thrombosis of the petrosal sinus in 1, temporo-sphenoidal abscess alone in 8, temporo-sphenoidal abscess and cerebellar abscess in 2, and cerebellar abscess alone in 10.

The accompanying table shows the relative frequency with which the usual symptoms mentioned in the text-books have occurred in each group, and the leading points may be briefly summarised.

In the 17 cases of temporo-sphenoidal abscess intense headache was present in all, vomiting in 13, drowsiness deepening to coma in 10, optic neuritis in 5.

In the 9 uncomplicated cases temperature and pulse were subnormal in 2, in the cases with meningitis the rate was much above normal, and in the 2 cases with cerebellar abscess subnormal.

In the 6 cases with meningitis delirium, restlessness, etc., were present.

In only 1 case, and that one of the uncomplicated ones, was the pupil on the affected side dilated and fixed.

In 4 of the 22 cases the patellar reflexes could not be elicited. Sudden death occurred in two of the uncomplicated cases. In *no* case was an acute mastoid abscess present.

One of the cases with meningitis had rigors, and developed a septic broncho-pneumonia.

Among the 21 cases of cerebellar abscess, headache was present in 19, vertigo in 5, vomiting in 13, drowsiness in 11, optic neuritis in 3, subnormal temperature and slow pulse in 3 only, constipation in 4. Rigors occurred twice in the cases with meningitis and twice in those with lateral sinus thrombosis.

In the group with meningitis delirium, restlessness, with muscular twitchings, were a conspicuous feature. Sudden death occurred in 4 of the 10 uncomplicated cases, and in 1 other respiration ceased during the operation, and although the heart was kept going for several hours spontaneous breathing was never re-established.

In 10 of the 21 cases an external mastoid abscess was present.

Pupils were unequal in 1, nystagmus present in 3. The patellar reflexes never exaggerated, in 2 cases not obtainable.

Of the 20 cases of sigmoid sinus thrombosis rigors were present in 14, high and often remittent temperature in all, headache in 7.

Optic neuritis in 5, vomiting in 9. In all the 10 cases complicated with meningitis delirium, restlessness, and muscular twitchings were present.

Of the 33 cases of meningitis headache was present in 21, vomiting in 12, mental excitement and delirium in 16, drowsiness in 9. Muscular twitchings in 12, convulsions in 10, pupils dilated in 2, unequal in 3, optic neuritis in 8, elevated and fluctuating temperature in 21. Patellar reflex increased in 2, absent in 3, conjugate deviation of the eyes from the affected side in 3, towards the side in 2. External mastoid abscess was present in 17.

The absence of the classical symptoms is a striking feature of these cases; this is not due to an omission to note symptoms; in nearly all the cases definite mention has been made when symptoms of intra-cranial complications might have been expected but were absent.

Headache was almost uniformly present in those cases where a brain abscess was present.

Vomiting was very frequently noted, but was absent in half the cases of uncomplicated cerebellar abscess.

Drowsiness or coma were about equally frequent in cerebral and cerebellar abscess.

Optic neuritis was more frequently observed in cerebral than in cerebellar abscess, and was rather remarkably common in the cases of meningitis, being present in 8 out of 33.

Subnormal temperature and slow pulse were comparatively infrequent, being only found in 8 cases of abscess out of 38.

Infection of the sigmoid sinus and meningitis were almost invariably associated with high temperature, and in the former group the usual remittent temperature was found in all but two cases.

The condition of the pupils was rarely an aid to diagnosis; in only 1 case of temporo-sphenoidal abscess was the typical dilated pupil on the side of the lesion present. Conjugate deviation of the eyes was not present in any of the cases of cerebellar abscess, although found in 1 case of cerebral abscess with meningitis and in 5 cases of simple meningitis.

Nystagmus occurred in 3 cases of cerebellar abscess. The patellar reflexes were absent in 4 cases of cerebral abscess and in 2 of cerebellar.

Delirium, muscular twitchings, contractions, or convulsions were almost uniformly present in all the cases where meningitis caused death.

Rigors occurred in 16 out of the 26 cases of thrombosis of the sigmoid sinus, but were never observed in any uncomplicated case of cerebral or cerebellar abscess and in only one case of meningitis.

There was an antecedent history of chronic otorrhœa in 21 out of the 33 cases of meningitis, in 17 out of the 20 cases of sinus thrombosis, in 20 out of 21 cases of cerebellar abscess, in 13 out of the 15 cases of cerebral abscess, and in 1 of the 2 cases of combined cerebral and cerebellar abscess.

The average age of the cases of sinus thrombosis was fifteen, 7 being under ten.

The average age of the cases of meningitis was almost seventeen, 16 cases (nearly half) being under ten.

The average age of the cases of cerebellar abscess was twenty, 3 being under ten.

The average age of the cases of cerebral abscess was twenty-three, only 1 being under ten, and that was a case of combined cerebral and cerebellar abscess.

Lastly, it is a feature of some interest that external mastoid signs were never observed in association with temporo-sphenoidal abscess, but occurred in about half the cases where cerebellar abscess or meningitis caused death.

Dr. A. Knyvett Gordon inquired, with regard to the cases where meningitis was found, whether it had arisen by direct or by lymphatic extension, also in what percentage, approximately, of the 135 cases was there a history of a previous attack of one of the exanthemata.

Dr. Milligan remarked that in these 135 cases Mr. Whitehead had said twenty-two of them were of tubercular meningitis. That led on to the statement about the advisability of not performing upon those infants any very extensive operation at one particular time. Dr. Milligan reminded members of the Society that that was a point he emphasised some little time ago in connection with this particular subject, and that he then suggested that these cases should be operated upon in stages. He was pleased to hear that Mr. Whitehead held a similar view. In such cases the children are so asthenic and feeble that they are quite unable to stand any formidable operation at the moment, and the practice which seemed advisable was, in the first instance, to open and drain the infected area, and then later on to perform, if necessary, some more radical operation. It was an important practical point and it was borne out

by what Mr. Whitehead had said. He asked Mr. Whitehead in how many cases of cerebellar abscess nystagmus was present.

Mr. Walker wished to support Mr. Whitehead as to the disadvantage of doing a very thorough operation on the mastoid in tubercular children. In infants the temporal bone is so soft that it can be scraped almost entirely away. It was his practice merely to well drain the abscess cavity, and if necessary to do a more complete operation when the child is older and stronger.

Dr. Logan Turner said he was interested to learn about the various means of diagnosis in regard to some of the intra-cranial complications. There is no doubt cases occasionally occur in which the classical signs and symptoms are absent. Two means which help still further in these difficult cases are the examination of the cerebro-spinal fluid and the examination of the blood. Fresh attempts have been made recently to throw light on difficult cases by these methods, and some interesting papers on this subject have been presented. The leucocyte count is higher in meningitis cases than in cerebral abscess cases. Again, the percentage of polymorpho nuclear leucocytes is raised when meningitis or cerebral abscess is present. That is the result of the blood examination; but when this method is utilised with the examination of the cerebro-spinal fluid, the tension and turbidity of the latter, along with the presence or absence of organisms in the fluid, are of assistance. He thought that as a Society they should make more careful observations on these points, and see whether some assistance could not be derived from the collected material.

Mr. Whitehead, in reply, said with regard to the presence of a distinct path of infection in the cases of meningitis, in quite a large number of his cases there was a definite track, but in many cases there was no obvious connection. He could not give the percentage of the cases arising from exanthemata; he had no actual statistics on that point. With regard to the difficulty he had mentioned in operating upon children he apologised to Dr. Milligan for not attributing to him the origin of that suggestion. By following his plan in two cases he was successful in saving lives that otherwise might have been lost. In reply to Dr. Milligan's question concerning nystagmus it was present in only three out of twenty-one cases of cerebral abscess. With regard to Dr. Logan Turner's question the blood was examined in several cases, but the number was not sufficiently large to be included in the statistics. Several of these cases had lumbar puncture performed upon them, and his experience was not satisfactory.

Positive results were only obtained in those cases of advanced meningitis where the symptoms left no possibility of doubt. He had not found it useful in the difficult cases where the diagnosis lay between early meningitis or acute cerebral abscess. Examination of the blood and cerebro-spinal fluid only gave positive information in those cases where the diagnosis was beyond doubt. It is only by considering the probability of symptoms or groups of symptoms occurring in the different classes of cases that reliability can be obtained in methods of diagnosis. During the last few years the study of these tables indicating the relative frequency of symptoms had been of great assistance to him, and he thought they might be helpful to the members of the Society in the future.

Some Further Experiences of the Radical Mastoid Operation in Scarlatinal Otitis.

By A. Knyvett Gordon.

At this time last year I submitted to this Society the results of an attempt that I had then recently made to deal with certain intractable cases of scarlatinal otitis by the performance of the radical mastoid operation at a somewhat earlier stage than usual. I now propose to describe briefly the results I have had since that time, in order that, if time permits, they may be discussed by this meeting.

May I, in the first place, make a short personal explanation? I find that I am supposed to have advocated last year the performance of the radical operation in the acute stage of scarlatinal otorrhœa. Evidently, in the enforced hurry of the moment, I could not have made myself clear on that point, though I think my meaning is evident if the paper itself be read. What I intended to put forward was that it might be advisable to perform the radical mastoid operation in selected cases before the patient left hospital, instead of waiting several months, or even years, until the temporal bone was extensively diseased. In point of fact, the operation was usually performed in from one month to three months after the onset of the otorrhœa.

I have now performed the radical mastoid operation seventy-one times altogether in scarlatinal cases—that is to say, in fifty-three instances last year. In these fifty-three there has been one death, and in no other case has the operation failed to effect the object for which it was performed, viz. to cure the otorrhœa.

The death was due to the onset of meningitis on the fifth day after the operation; this was found (*post mortem*) to have arisen by lymphatic metastasis, and not by direct extension from the site of the operation.

The remaining cases were all kept under observation in Monsall Hospital until the discharge had ceased for at least a fortnight and the cavity appeared to have thoroughly healed after repeated inspections.

The period at which the operation was performed varied from one to two months after the onset of the otorrhœa. In no case was it undertaken until intra-tympanic treatment had been tried for at least a month without obvious effect. The number of cases of otorrhœa treated was 340, so that the radical mastoid operation was performed in 15·6 per cent.

It is thus obvious that in the majority of cases intra-tympanic treatment was successful. I mention this as it is an obvious criticism of any radical procedure that simpler methods might have sufficed to effect a cure.

The period elapsing between the operation and the cessation of the discharge varied from four to ten weeks: the average time was six to seven weeks.

The operation was performed in the usual manner and the tip of the mastoid was explored in each case and the posterior meatal wall removed as freely as possible. The gouge and mallet were used for the first incision in the bone, but the greater part of the work was done by the gouge alone or by Jansen's forceps; the burr was used but sparingly, and only towards the conclusion of the operation in a few cases. The posterior auricular wound was sewn up in all cases, a small drainage-tube being used at the lower angle for forty-eight hours only. Pure peroxide of hydrogen was used freely during the operation, the cavity being subsequently douched with 1 in 500 izal solution, and then packed with 10 per cent. izal gauze. Reflected limelight was employed during the operation in every case, and the wound was dressed, as a rule, on the third day through the meatus which was purposely made as wide as possible, Ballance's flaps being usually employed for this purpose. Light packing was generally used for a fortnight to three weeks subsequently.

The results as regards hearing have been satisfactory. In no case was the hearing worse after the operation, in the great majority of cases it had improved moderately or slightly, in six a very great improvement took place. For this purpose the observations

of the nurses on the patient's condition during convalescence were taken into account as well as the tests made by my colleagues from time to time, and by myself before the discharge of the patient from hospital. In the majority of the cases a marked improvement in the patient's mental condition, apart from the state of the hearing, also took place. It is evident, therefore, that the performance of the radical mastoid operation at a comparatively early stage does not, as a rule, damage the hearing.

It has been said, however, Why do a radical mastoid at all at this stage? Why not open the antrum simply, and reserve the radical operation for a future period, if necessary? To this I would reply that I have been only concerned with hospital patients of the poorer class. Whenever there has been the possibility of obtaining special advice for children subsequently, and time was no object, I have not hesitated to allow them to leave hospital, with their ears discharging, to be under the care of their usual medical adviser. Especially in this part of the world parents do not believe in the existence of a thing that they cannot see, and advice to take their children to otologists or to an otological clinique is almost invariably ignored.

Then, in scarlatinal otitis there is almost always an inflammation, however slight it may be, not only of the bone immediately surrounding the mastoid antrum, but also of the entire mastoid process right down to the tip. A simple antrotomy, therefore, hardly suffices. It is necessary to remove bone extensively, and I have frequently found sinuses leading from the antrum right to the mastoid tip, and on following these up small localised abscesses in the latter situation. A fairly extensive removal of bone is, therefore, necessary in any case, whether the tympanum be touched or not.

Then, I do not altogether feel satisfied with the results of these antrectomies, and I certainly regard a simple antrotomy as of practically no value at all. During the last year I have performed the antrectomy in thirty-eight cases; in eight it was done as a last resort in the acute stage of hopelessly septic cases, and of these three died of the original toxæmia. In the remainder it was performed for the cure of a local mastoid abscess in fifteen cases, and as a substitute for the radical mastoid operation for the cure of otorrhœa in another fifteen. In these latter the wound took longer to heal than in others where the radical operation had been performed; in all there was marked subsequent deafness, and in five the otorrhœa was not cured.

I am of opinion, therefore, that it is not advisable, at all events

where time is of any account, to commence by a preliminary antrotomy or antrectomy. In the bulk of cases careful intra-tympanic treatment, as I have said, effects a cure; where this fails, and as soon as it is certain that it has failed, I prefer the radical mastoid operation.

In conclusion, I wish to emphasise the fact that in scarlatinal otitis we have an infection of the whole tract, from Eustachian tube to the mastoid cells, antrum, and tympanum, accompanied by a definite osteitis where that tract is bony, and not simply a catarrhal inflammation of the lining membrane of the tympanic cavity. Moreover, the signs of this osteitis of the mastoid, even when it has gone on to suppuration, are often entirely absent clinically. I have during the last year examined the temporal bone in all cases except two that have died from scarlatinal septicæmia, and have repeatedly found pus and carious bone on the mastoid side where there has been no otorrhœa whatever during life. In two cases during the last year this had given rise to pyæmic suppuration in one or more joints, and was only detected at the autopsy, though in all cases a most rigorous watch was kept on the ear and its adnexa while the child was alive.

This being so, it is difficult to regard as adequate the treatment pursued in many fever hospitals, which consists in having the ears syringed by the nurse with one or more antiseptic lotions. The need for the appointment of otologists to fever hospitals is, in my opinion, imperative and pressing. Moreover, the resident staff should be skilled in the ordinary routine procedures of at least elementary otology.

Mr. Walker said he had only rarely seen cases of mastoid suppuration during the scarlatinal attack. Early this year he had to operate on such a case. The patient, a boy, began with scarlet fever on December 27, 1905. Five days later the right ear began to ache, and there was a slight discharge. On January 21 the mastoid became puffy and swollen, and was incised by the patient's own medical man, and pus escaped. At the end of a week there was a fresh collection, and Mr. Walker saw the case in consultation. There was an acute mastoid swelling with a high temperature; pus was found superficially and forcing out under pressure through a small opening in the squamo-mastoid suture. The pus was almost entirely contained in the mastoid cells below the antrum; this was almost empty. The antrum was thoroughly opened, so that the iter could be seen. The middle ear and iter were left untouched

except for douching. Dr. Porter had recently written saying that the wound had entirely healed, and the hearing power was perfect.

Dr. Bronner said that in his experience of scarlatinal cases there is great danger involved if the wound behind the ear is allowed to close too soon. When there is much disease of the bone, he makes a large incision behind the ear and removes the diseased bone, but better hearing is obtained if the attic is not opened. He had a peculiar case of scarlet fever in which there was a great swelling behind the ear, which he opened at once. To his surprise, however, he found that there was scarcely any pus in the mastoid cells. It was a peculiar distension of the whole of the mastoid process.

Mr. Whitehead was also of the opinion that there is much more disease in the mastoid than in the middle ear, and that by leaving the attic and the middle ear alone and clearing out the whole of the mastoid, keeping a large opening from behind, just as good a result is obtained.

Dr. Gordon (in reply) said that where there are obvious local signs of mastoid disease the best operation is that described by Whiting, in which the mastoid side is attacked very freely and the tympanic side left alone. In the cases that he—Dr. Gordon—had described there was tympanic as well as mastoid necrosis. With one exception he had not performed the radical operation in any case in which the otorrhœa had not persisted, in spite of intra-tympanic treatment, for at least a month. The more usual period had been six weeks to two months. In the excepted case the disease had advanced so rapidly that after only six days' otorrhœa he found both the tympanic and mastoid sides practically a mass of pus and osseous *débris*; he therefore performed the radical operation, and the child did well. With regard to the question of keeping the wound behind the ear open, his own practice had been to sew it up with a small drain at the lower angle. In only one case was there any difficulty in obtaining a satisfactory cure, and there he did not make the new meatus sufficiently large. If the wound should heal by first intention a considerable saving of time is effected, and it is quite easy to open it up again if primary union does not occur.

The Mode of Continuity of the Fibres of the Auditory Nerve with the Auditory Sense Epithelium and with the Nuclei in the Hind-Brain.

By J. Cameron and W. Milligan.

The cochlear division of the auditory nerve in man consists of

fibres which arise from the bipolar cells of the spiral ganglion, and pass from there peripherally to the auditory sense epithelium, and centrally to the cochlear nuclei in the hind brain. These fibres are described as ending in arborisations around the bases of the sense epithelial cells, and similarly around the cells in the cochlear nuclei, there being thus no direct anatomical continuity between the various cell-elements. The auditory nerve fibres, together with the cell in the spiral ganglion, compose a distinct neuron system—the peripheral auditory tract.

A large amount of evidence has, however, lately been brought forward to show that there is actually direct anatomical continuity between the various neurons throughout the central nervous system. The present investigation was, therefore, instituted for the purpose of ascertaining whether this new idea could apply to the auditory nerve. This view is certainly supported by the results of degenerative changes in the peripheral auditory tract. Thus Baginsky has shown that after destruction of the labyrinth in rabbits there is atrophy, not only of the auditory nerve, but also of the cells in the nuclei of the hind brain. An almost exactly similar effect follows section of the auditory nerve. These changes are suggestive of a much more intimate connection between the cell-elements than can be explained merely by a system of neighbouring synapses.

We considered that a study of the mode of development of the auditory nerve might afford some idea of the actual mode of continuity. It was found that the cells of the auditory ganglion during the early developmental stages in lower vertebrates constitute a complete chain of communication between the otic vesicle and the hind brain. Both the nucleus and the cell-body of certain cells in the middle of this chain become much enlarged (γ-neuroblasts) and form the auditory ganglion of the adult, but the remainder of the cell-nuclei remain in their relative positions, and constitute the nuclei of the nerve-sheath (β-neuroblasts). It is important to note that only a small proportion of the cells of the embryonic auditory ganglion become constituent cells of this ganglion in the adult. Moreover, their central and peripheral processes do not grow towards the hind brain and the sense epithelium. This connection exists from the early embryonic condition.

The protoplasm of the cells constituting the embryonic auditory ganglion becomes differentiated in a definite manner, so as to form the fibres of the auditory nerve. This consists in the appearance

of more deeply staining tracts in this protoplasm. These tracts of differentiation appear simultaneously throughout the whole length of the embryonic auditory ganglion. Each tract is associated with a large number of the nuclei of that ganglion, which become applied along each side of it. One of these nuclei becomes the nucleus of a cell in the adult auditory ganglion, while the others become the nuclei of the nerve-sheath, as already mentioned. The auditory nerve is thus to be regarded as multicellular in origin, a conclusion which confirms the results of Fragnito, Schultze, Bethe, Apáthy, and others in the case of the spinal nerves.

A direct anatomical continuity of the fibres of the auditory nerve with the sense-epithelium can be readily observed in amphibia; for in this class of vertebrates the bases of the auditory cells are prolonged into fine processes which may frequently be found to be continuous with the delicate fibrils of the auditory nerve, especially if the iron-alum-hæmatoxylin stain be employed. A similar continuity of the auditory nerve fibres with the cells in the hind brain can likewise be readily studied in amphibia, for the fibres when traced into the substance of the hind brain will be found to blend with the protoplasm of the above cells.

The results recorded in this preliminary communication are mainly founded on a study of amphibian embryos, and we intend to extend our investigations to the other vertebrate classes, mainly with the view of making a comparative study of the development of the auditory nerve.

The President remarked that the valuable paper they had listened to was a considerable step forward in their knowledge of the anatomy of the internal ear.

Dr. Pritchard agreed generally with the observations of the demonstrators. There was one point, however, in which he differed, and that was in regard to the hair-cells; they are of two kinds, and are alternately bristle-shaped and thorn-shaped.

Dr. Milligan said that Dr. Cameron had put their views so well that it was unnecessary for him to add anything to what Dr. Cameron had said. Their investigations had been confined to the lower vertebrates, and they hoped on another occasion to bring forward the result of the investigation of the human auditory nerve. The investigation had proved one important point, namely that there is no synapsis between the nerve and the auditory epithelium.

The Influence of Pregnancy and Parturition upon Certain Forms of Progressive Deafness.

By W. Milligan.

The peculiar metabolic changes, both general and local, to which pregnant women are subjected find expression, not only in various reflex aural phenomena of a temporary character, but also in the incidence of certain organic changes, frequently of a progressive and permanent nature.

During the period of child-bearing various systemic disturbances of vaso-motor origin lead to temporary labyrinthine changes, mainly of a congestive type, accompanied by hyperacusis, hyperæsthesia, vertigo, and pulsating or rushing tinnitus. Once the equilibrium of the vaso-motor centres has become re-established with a simultaneous restoration of health these auditory phenomena pass off, leaving no lasting effects. There is, however, another and an entirely different series of changes which are not by any means uncommon and which are of great practical importance, changes which take place either in an ear previously perfectly healthy or in an ear already weakened by catarrhal or oto-sclerotic disease. Every aurist is familiar with the fact that in certain cases of purulent and non-purulent middle-ear catarrh, and in certain cases of capsulitis labyrinthi each successive pregnancy still farther impairs an already weakened organ of hearing. In such cases frequent pregnancies may render the patient so hopelessly deaf as to cause severe mental depression and prevent her from taking any active part in social life. The important question at once arises, to what extent is the aural surgeon justified in warning such patients of the possible evil effects of pregnancy, and especially of repeated pregnancies, upon the organ of hearing, and the problem is still farther accentuated when the patient is a young girl already partially deaf and about to marry. This question has so interested me, and appears to me to be of such importance, that I venture to bring it before this meeting.

Apart from those labyrinthine disturbances due to temporary aberrations of the vaso-motor centres, the prognosis is indeed grave. In many women each successive pregnancy induces an increased loss of hearing, rarely unilateral, almost invariably bilateral. Loss of hearing may in some of these cases be attributed to the general shock which in certain individuals follows a tedious and painful parturition, in others to the presence of an hysterical

element, anæmia of the auditory nerve-centres, or to a general toxæmia of pregnancy. The toxæmia of pregnancy is frequently a matter of distinct gravity. So long as all the emunctory organs perform their function adequately, the general economy becomes adapted to its new conditions and toxic symptoms gradually pass off. If, however, any one of the emunctory organs is unable to stand the high pressure at which it is being worked severe toxic infection ensues. Certain vascular changes also take place. There is a tendency to anæmia and to hydræmia. Leucocytosis is well marked, and the amount of fibrin is increased. Such changes, toxic and vascular, contribute materially to nerve-tissue degeneration.

In a recent paper upon "Lesions of the Spinal Cord the Result of Absorption from Localised Septic Foci," Orr and Rows (*Review of Neurology and Psychiatry*, January, 1906) have shown that lesions of the spinal column can be produced by the ascent of toxines, or in some cases even of organisms, from peripheral foci of inflammation either of an acute or chronic nature. They have further demonstrated that similar changes take place in cranial nerves. In one particular case in which there had been a fœtid discharge from the ear for years, and where the mastoid antrum and cells were found upon *post-mortem* examination to be full of pus, there was distinct degeneration of the eighth nerve, the degeneration beginning at its point of entry into the medulla—that is, where the nerve-fibres lose their sheaths of Schwann. These degenerative lesions of the sensory protoneurons appear invariably to begin at the point where the sheath of neurilemma ceases and to spread backwards from that point. In a pregnant woman already the subject of chronic suppurative middle-ear disease the transmission of toxines along the perineural sheaths of the auditory nerves is favoured by the generally lessened want of resistance the result of child-bearing. Clinically evidences of auditory nerve degeneration are quite frequent in such cases, and the rapid augmentation of deafness is apparently due, not to the increase of any gross pathological peripheral lesion, but to a central degenerative change of toxic or organismal origin. This helps materially to explain why treatment has so little effect in these particular cases.

In my own experience the worst cases of loss of hearing are seen in young and anæmic women, and especially amongst those where a family history of deafness exists. Such patients are prone to become increasingly deaf, and the marked loss of hearing which follows each confinement would appear to be directly associated

with degenerative changes induced during, and aggravated by, pregnancy and the nursing of the infant.

When we come to deal with those cases where there has been no septic disease present in the middle ears at any period, but where catarrhal or oto-sclerotic changes have previously existed, we find a similarly marked increase of deafness in certain women both during the period of pregnancy and more especially perhaps after parturition. In such cases it may be that the auditory nerve-terminals have been already injured by the local disease and hence their general power of resistance impaired. These same fibres would, therefore, suffer more as the result of a general toxæmia such as may be associated with pregnancy, the toxines ultimately invading their nuclei of origin.

Little, if any, benefit is effected by local treatment, and the result of an exhibition of such drugs as iron, arsenic, strychnine, phosphorus, thyroid extract, etc., is very disappointing. Possibly some anti-toxin or some serum may yet be found capable of neutralising the effects of the toxins floating in the perineural lymph-spaces.

The points which I specially wish to raise are: (1) the advisability or otherwise of young women already the victims of advanced chronic middle-ear catarrh, purulent or non-purulent, or of otosclerosis, entering into matrimony; (2) if marriage has already taken place and the existing deafness has been materially increased by a first pregnancy, the advisability or otherwise of suggesting means to prevent any farther pregnancy; and (3) if in a case of advanced deafness where previous pregnancies have invariably increased the existing deafness, and where the patient is again pregnant, whether it is advisable or justifiable to induce premature labour.

Mr. Yearsley mentioned a case of otosclerosis which he was able to follow some time ago. Like so many early otosclerosis cases, she showed increased bone-conduction. After her first child she was very much more deaf, but the bone-conduction had decreased. She had two other children, and grew progressively deafer after each parturition and lost more bone-conduction. He asked Dr. Milligan whether it was not rather the processes following parturition that had a bad effect upon these cases than pregnancy itself. He thought a great deal might be learnt if a series of blood counts were taken in these cases.

Mr. Whitehead said in his experience deafness had not

increased during pregnancy, but rather during the period of feeding the child; it is more due to general debility following upon prolonged breast feeding than to pregnancy or partition.

Dr. Bronner agreed with Mr. Whitehead that deafness increases after child-birth, and that it is absolutely due to general debility and probably loss of blood. He had a very interesting case of a lady who had chronic aural catarrh, and he told the husband that the deafness would probably increase after child-birth. The lady eventually was taken to see somebody else, who said he could cure the deafness by an operation. The only result of that operation was that there was a great loss of blood and the hearing became very much worse. Then after a few months she had a child and got worse again. The case was very interesting because it showed that the increase of deafness was due, not to any toxin, but to the great loss of blood both after the operation and after child-birth. In many cases the deafness appears to be worse than it is because of the tinnitus.

Dr. Birkett, of Montreal, said that in his experience these cases of incipient deafness were undoubtedly made worse by marriage, and it had always been his practice to speak very frankly to the young persons about to be married as to the probability of the deafness increasing, and then leave them to expect the consequences. These were matters, as they all knew, which could not always be controlled, but one could always advise, and he thought that was the right course to pursue—to place before the patient the situation and inform her of the inevitable result which follows marriage in such a case. As to the cause, it always appeared to him to be largely the debility following parturition. He had found these patients to be benefited very little by local treatment. He thought that attention towards the general health was absolutely essential.

Dr. Dundas Grant said Dr. Milligan had raised an important question from the sociological standpoint. They might feel very strongly on these cases, but before recommending interference with normal gestation it would be necessary for them to make quite sure as to the relation of cause and effect. It would be necessary to differentiate the forms of deafness and not mix up ordinary chronic catarrh with sclerosis of the middle ear, because in such a case the advice would not apply. It should be confined to those in whom the diagnosis of sclerosis is undoubted. In the next case they should make sure that the prognosis is as bad as they have been led to suppose. Sometimes they were pleasantly surprised in

those cases when an unfavourable prognosis is not verified by the result. The deafness often begins with child-birth, and gets worse each time, yet it does not always follow that marriage always results in pregnancy. They should therefore not be too urgent in advising women to avoid matrimony, although he agreed that one might let them know the possibility and then leave it to them to judge for themselves.

Dr. Paterson did not know whether Dr. Milligan desired to distinguish between pregnancy and suckling. Dr. Paterson, in his experience, found that with a family history of deafness there was very often a distinct increase of deafness with each period of pregnancy. When there is such a family history some warning might be given, but in many other cases he thought there was no serious need for warning.

Dr. Milligan, in reply, said it was a most important question both from its purely scientific and from its social point of view. He would be the last man to counsel a young couple not to have children, but he had felt strongly, in various cases which he had seen in practice, the extremely deleterious effect of child-bearing. He had certain views on the subject, particularly as to during which period the progress of the trouble is worst, and where its exact origin is. He mentioned a case which came under his notice lately. It was that of a young lady from Norwich, whose deafness had much developed since she had had a child. He wrote to her medical adviser, and he warned the husband as to the dangers that might follow a second pregnancy in his wife's case. He received a reply that evidently the patient had not told him she was again pregnant, and asking if, under the circumstances, it would be justifiable to induce premature labour. That was a very difficult question to ask, and an equally difficult question to answer. He wrote back telling him that in the circumstances he could not take the responsibility of advising the induction of premature labour, but that he thought when the second labour was over it would be his duty, as a medical man, to advise her not to have any further pregnancies. The subject is one which raises so many important social points that he thought it would be worthy of a special discussion. It is a subject upon which is wanted a certain amount of unanimity in the profession in order that one may feel confidence in giving advice. If there were a certain amount of unanimity founded on a general discussion it would be helpful.

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